REVIEW OF GREAT BEAR LAKE FISHERY MANAGEMENT GOALS

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REVIEW OF GREAT BEAR LAKE

FISHERY MANAGEMENT GOALS

- VOLUME 1 FINAL REPORT-

AUGUST 1985

Western Region
Department of Fisheries and Oceans
Winnipeg, Manitoba

Department of Economic Development and Tourism
Government of the Northwest Territories
Yellowknife, N.W.T.

Department of Renewable Resources
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MEMORANDUM OF TRANSMITTAL

We, the members of the Great Bear Lake Working Group, formed at the request of the Director, Arctic Operations of the Department of Fisheries and Oceans and the Deputy Minister, Department of Economic Development and Tourism, Government of the Northwest Territories, submit herewith our final report. The displayed endorsements indicate the Working Group members are in general agreement with the management goals and strategies proposed in this report.

The Working Group also agreed it is both timely and essential to involve the community of Fort Franklin and the lodge industry more directly in further discussions of the management of Great Bear Lake. We therefore advise the participating Federal and Territorial agencies to implement immediately the recommendation to form a Great Bear Lake Advisory Committee and to use this committee as a forum to achieve consensus on future management initiatives, including those proposed by the Working Group.

WORKING GROUP MEMBERSHIP	SIGNATURE	NOTES, IF ANY (APPENDIX A)
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EXECUTIVE SUMMARY

The Working Group has examined the management issues in the Great Bear Lake fishery and recommends the following goals, strategies and management process for consideration in the development of a long-term fishery management program.

RECOMMENDED MANAGEMENT GOALS

- To ensure Great Bear Lake's fish resources are properly protected;
- To ensure fish resources available for harvesting make their greatest contribution to the economic and social development of the people of Canada, especially residents of the Northwest Territories. Benefits will be maximized if the following goals are pursued:
    - * To provide sufficient fish resources for the domestic fishing needs of the Satudene;
    - * To sustain a high quality sport fishery as the best use of lake trout stocks;
    - * To provide resource owners with an economic rent consistent with the value of fish resources used in the sport fishery;
    - * To accommodate the economic development goals of the Satudene, subject to the above-stated resource management goals.

RECOMMENDED MANAGEMENT STRATEGY

- The current, flexible arrangements of the domestic fishery should be continued as the most practical means of providing sufficient fish resources for the domestic fishing needs of the Satudene;
- A licence and licence fee system should be developed specifically for Great Bear Lake's sport fishery, for both lodge-access and itinerant anglers. As necessary, limitations on licence numbers should provide a more direct control on sport fishing effort and harvest than can be achieved with the present regulatory system;
- All anglers should be charged a licence fee which better reflects the value of the right of access to a public resource which is proposed to be intensively managed for high quality recreation opportunity;

- The Keith Arm and a portion of the McVicar Arm should be reserved for the future economic development plans of the community of Fort Franklin. No lodge-access fishing should be allowed in these areas pending the development of a long-term fishing plan by the community;

- The Department of Economic Development and Tourism should evaluate the suggestions for guide training made by the Satudene and the stated willingness of the industry to participate in training programs and, pending their development plans, implement a lodge employment training program for the Satudene;

- Future development proposals, for either lodge-access sport fishing or large-scale commercial fishing, should be consistent with the management goals adopted for the fishery. Proponents of development should be required to prepare a formal proposal for the participating Federal and Territorial agencies and their Advisory Committee which addresses the availability of fish resources, the relationship to other uses, and the feasibility of development;

- Small-scale commercial fishery development, based on local sales of surplus fish harvests, should be allowed without formal review. A system should be developed to monitor use patterns of this fishery.

RECOMMENDED MANAGEMENT PROCESS

A more intensive management system will be required to ensure decisions can be made with adequate, timely information. This will require a firm commitment to the research, monitoring and evaluation of the fishery. There is a need to convey this information to all resource users more effectively and to consult with them in order to ensure that management proposals are well founded. There will also have to be ongoing efforts to coordinate Federal and Territorial initiatives for all resource uses, so that the fishery resources of Great Bear Lake are put to their best use and public funds are not wasted. The Working Group recommends:

- Formation of an Advisory Committee to the participating Federal and Territorial agencies, with one member from each of the community of Fort Franklin, the lodge industry, Fisheries and Oceans, Economic Development and Tourism, and Renewable Resources;

- Coordination of financial assistance programs for resource use on Great Bear Lake with the long-term management plans for the fishery;

- Development of a management information system by the Department of Fisheries and Oceans which includes a monitoring system for all resource uses, a commitment to sufficient basic biological investigations and increased enforcement of the fishery.

INTRODUCTION

PURPOSE OF REVIEW

The Great Bear Lake Working Group was formed to inquire into and report on the management options in allocating the fish resources of Great Bear Lake. The terms of reference for the Working Group (Volume 2 Appendix 1) indicated this was to be accomplished by:

Defining the objectives of the Department of Fisheries and Oceans and those agencies likely to be affected by DFO resource allocation decisions, with respect to resource management and economic and social development;

Defining and evaluating current and other choices of the use of the fishery through a review of existing information;

Recommending a long-term management strategy in light of the evaluation of objectives and alternative uses;

Recommending an interim management strategy which will bridge information gaps and any other constraints which may exist but which will ensure the long-term management objectives are met. The interim policy will identify the information requirements for the continuing evaluation of the fishery, including the programs and analysis required for this purpose; and,

Evaluating the available policy instruments and legislation to meet the objectives of the Department of Fisheries and Oceans for each use.

METHODS OF REVIEW

The Working Group included three representatives from the Department of Fisheries and Oceans and one representative from each of the Department of Indian and Northern Affairs, the Department of Economic Development and Tourism, and the Department of Renewable Resources.

The Working Group met to review the goals of each agency and the biological and economic principles of fishery management, so that a consistent framework could be developed to evaluate alternative choices of use. Available information on existing and proposed choices of use was documented, and in the case of a commercial fishery proposal, a preliminary feasibility analysis was done. This material was consolidated in the Working Group's interim report of April, 1984 (Volume 2 Appendix 2). The report was distributed to the community of Fort Franklin, the Travel Industry Association and the Great Bear Lake lodge operators, as well as to senior officials in each participating agency, so that there could be an open discussion of the choices which must be made in planning for the future.

The Working Group met with the community of Fort Franklin in Fort Franklin on April 25-26, 1984 in order to discuss the interim report and to solicit comments from the community on the future management of the lake.

Subsequently, a consultant was retained by the Department of Indian and Northern Affairs to assist the community in it's review. Their draft response, "Fish Management in Great Bear Lake", was received by the Working Group February 28, 1985 and is included as Appendix 3 of Volume 2.

The Working Group met with four of the Great Bear Lake lodge operators in Edmonton on May 30, 1984. This meeting was held to discuss the interim report and to solicit comments from the lodge industry on the future management of the lake. Subsequently, the Department of Economic Development and Tourism provided funds for a consultant to work with the lodge operators in their review of the interim report. The Working Group received the response from the Great Bear Lake lodge operators and the Travel Industry Association of the N.W.T. in January, 1985. Their report, titled "Position Paper Great Bear Lake Lodges on the Interim Report Management Plan for the Great Bear Lake Fishery", is included as Appendix 4 of Volume 2.

Upon receipt of the responses from both Fort Franklin and the lodge industry, the Working Group met to consider the advice it would provide in light of the management issues it had raised and the positions and further comments offered by resource users. To facilitate this discussion, the Working Group matched the issues stated in the interim report with the observations of the community and the lodges. This summary of the consultation process, presented in Appendix 5 of Volume 2, proved useful in mapping out the areas where consensus should be readily achieved and where substantive differences yet remain.

This report, which is being released simultaneously to the community of Fort Franklin, the lodge industry and the participating agencies, reflects the Working Group's considered opinion of the most effective management goals and strategies for the Great Bear Lake fishery.

PLAN OF STUDY

Each of several fisheries is addressed, management goals and strategies are recommended from stated alternatives, and the rationale for the Working Group's advice is outlined. Necessarily, the many inter-relationships among uses requires frequent cross-referencing of sections of the report.

An overview of the fishery, including a brief description of resource uses and management issues, is presented first. Those unfamiliar with the fishery or the Working Group's interim report may benefit by referring to Appendix 2 of Volume 2, for a more detailed profile of the fishery.

The first use considered is the domestic fishery, since this fishery is assigned the highest priority in use. The resource management issues in the the lodge-access sport fishery are examined next. The itinerant sport fishery, presently a minor use of fish resources, is addressed in the interest of providing a comprehensive review of management goals and strategies.

The section on community economic development addresses the means to accommodate the development goals of the Satudene with the resource management goals for the fishery. Sport fish potential is considered first, taking account of the resource management goal that lake trout stocks are best allocated to this use. Discussion of commercial fishery potential arises from

the Satudene's original request to develop a large-scale commercial fishery.

The final section outlines the consultative mechanisms, the coordination of government programming, and the management systems considered essential if the recommended goals for the fishery are to be achieved.

OVERVIEW OF THE FISHERY

HUMAN AND NATURAL RESOURCES

Great Bear Lake, the fourth largest lake in North America, is situated between latitudes 64'40 and 67' north and longitudes 118' and 125' west (Figure 1). The lake consists of five arms radiating from a large central area, named Dease, McTavish, Smith, McVicar and Keith Arms.

The Satudene, a term derived from the Slavey words meaning "bear-water-people", is the name given the people who traditionally inhabited all the country around Great Bear Lake. Over the years, the Satudene have been attracted from their nomadic lifestyle to the established permanent residence of the community of Fort Franklin, first developed for the Satudene in 1949. In 1980, the community's population was 545.

The extreme oligotrophic conditions of Great Bear Lake limit the species diversity and productivity of the fish resources. The principal species is lake trout (Salvelinus namaycush), found in greatest densities in areas adjacent to shallows and in depths of 12 m or less. Lake trout have been found to show only localized and generally limited movement in the lake. Lake whitefish (Coregonus clupeaformis) inhabit the bays, and are seldom caught in water over 20 m deep. Walleye (Stizostedion vitreum), burbot (Lota lota), and longnose suckers (Catostomus catostomus) are confined to the periphery of the lake.

RESOURCE USES

Domestic Fishery

Traditional dependence on caribou as a principal source of food obliged the Satudene to a migratory lifestyle and, accordingly, the domestic fishery followed a pattern where camps were established when both good fishing and hunting were possible. The existing outcamps and those slated for reconstruction are shown in Figure 1.

Whitefish has been noted to be the preferred species, although lake trout and lake herring are also of importance. While spot estimates suggest the domestic fishery has declined in recent years because of the Satudene's more sedentary lifestyle, the true extent of change is unknown. Various estimates have been made over time using undocumented methods which may be so varied as to render comparisons meaningless.

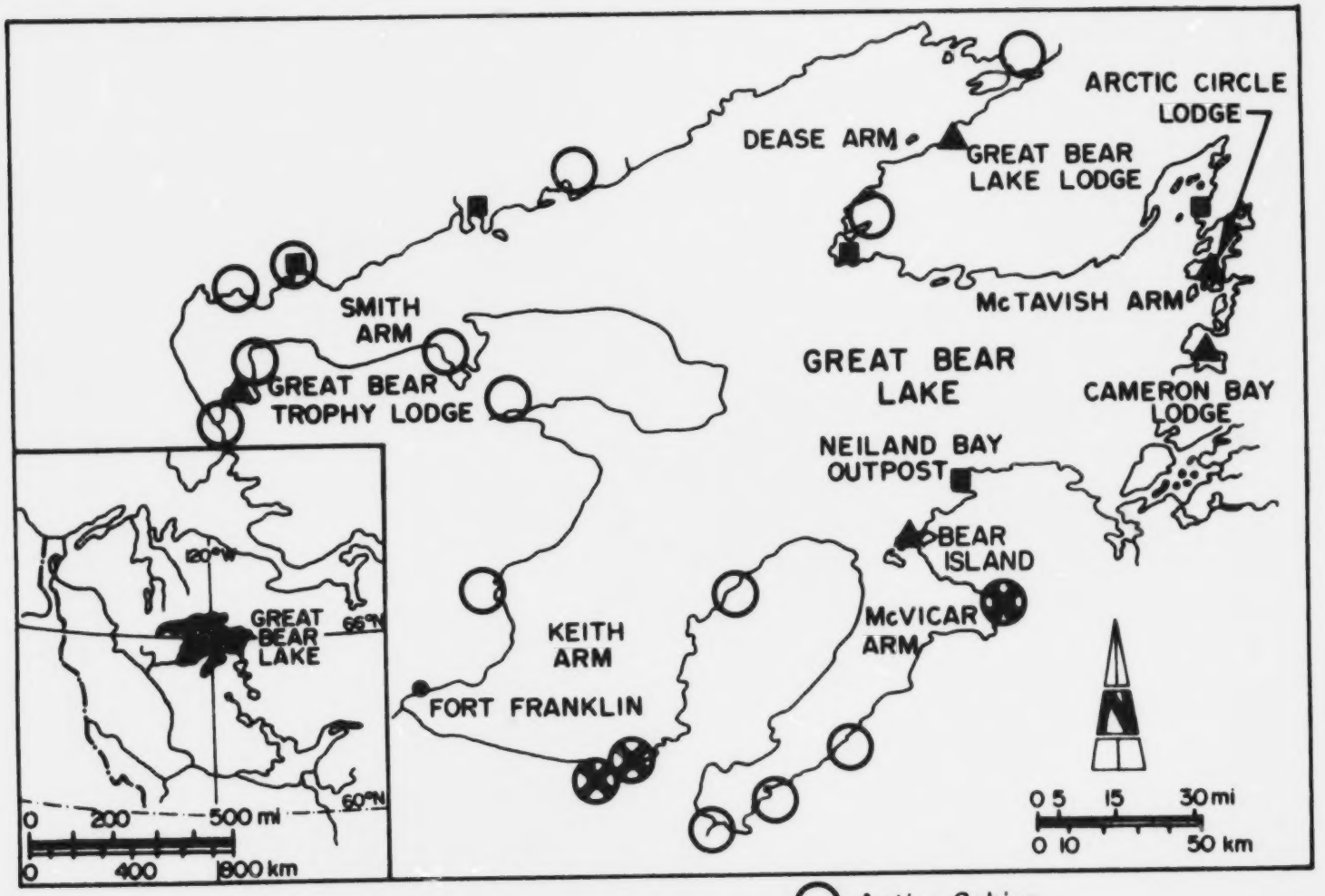

Figure 1. Location of outpost cabins and fishing lodges on Great Bear Lake.

Lodge-access Sport Fishery

Great Bear Lake is one of Western Canada's most prestigious sport fishing sites, renowned for the quality of lake trout fishing. Lodge development began in the 1950's, with the majority of lodge investments made in the following decade. The present industry consists of six lodges, with five outpost camps located in more remote parts of the lake. All are presently active, with the exception of the Sah Tew lodge in the community of Fort Franklin. The distribution of fishing lodges is shown in Figure 1.

The five active lodges, ranging in bed capacity from 34-54 beds, are estimated to serve approximately 1 300 guests each year. In 1972, lodge-access anglers were estimated to have harvested 46 897 kg of lake trout, an amount which likely represents an upper limit on harvests in any subsequent period to date. It has been estimated that Great Bear Lake lodges generate gross revenues of approximately $2 500-000 each year, realizing some $800 000 in value added in the form of wages, salaries, profits and rents. Included in this amount are wage and salary payments for some 225 individuals employed directly by the lodges. While the residence of lodge staff was not documented by the Working Group, it is thought the majority of staff permanently reside outside the N.W.T.

The management of Great Bear Lake has largely been concerned with the preservation of a high quality sport fishery. Significant management decisions for this sector have included the curtailment of any further lodge development (1965) and the introduction of special catch and possession limits for lake trout (1974 and 1979). Preserving fishing quality remains the central sport fishery management issue to this day.

Itinerant Sport Fishery

Presently, there is a very limited itinerant sport fishery, so the management issues are not pressing. However, access control for all uses, including the itinerant sector, will have to be considered if Great Bear Lake is to be managed for high quality fishing.

Commercial Fishery

The community of Fort Franklin, in a September, 1982 submission to the Department of Fisheries and Oceans, identified the development of a commercial fishery as a priority project. The community was provided a permit for a limited test fishery in the Keith Arm.

The Working Group, in it's preliminary analysis of the development potential for a commercial fishery on Great Bear Lake, concluded that a commercial fishery is not likely to be financially or economically viable under present conditions. This conclusion applied to development for export sales out of the NWT and to inter-settlement trade in the NWT.

The Satudene, in their response to the Working Group's interim report, stated their awareness of the impact a commercial net fishery could have on fish stocks in Great Bear Lake. The Satudene also noted that under current economic conditions an export market for Great Bear Lake whitefish may not be economically viable.

MANAGEMENT GOALS AND ISSUES

The need for a review of the management of Great Bear Lake was discussed for some years prior to the formation of the Working Group. Concern with the status of the lodge-access sport fishery, pressures for further development of bed capacity, the indirect effect on the level of domestic fishing activity as a result of funding provided hunters and trappers through the outpost camp program, and the request for a commercial quota were all factors suggesting a review was warranted.

In the conduct of it's review, the Working Group accepted stated agency goals which indicated an interest in ensuring that, subject to the requirement that fish resources be conserved, the fish resources of Great Bear Lake make their greatest contribution to economic and social welfare. Necessarily, differences in viewpoint between national, territorial and community perspectives were noted among the participating federal and territorial agencies.

The general principle of "best-use" was given some clearer definition through the acceptance of four objectives for a fishery management program, essentially as stated by the Commission on Pacific Fisheries Policy (1982). In the context of the Great Bear Lake fishery, the following goal areas were defined:

1. **Resource Conservation**

   to ensure that the fish resource is properly protected;

2. **Maximizing the Benefits of Resource Use**

   to ensure that fish resources available for harvesting make the greatest possible contribution to the economic and social development of the people of Canada, especially the residents of the Northwest Territories;

3. **Returns to the Public**

   to ensure the fishery provides an economic return to the owners of the resource consistent with the value of the resources used;

4. **Administrative Simplicity**

   to ensure regulation of the fishery is systematic and efficient, and to the greatest extent possible, conflicts with private incentives are minimized and the system is more conducive to self-regulation.

These goal statements can be classified as either "fundamental" or "design" objectives. The conservation, economic and social objectives are fundamental, the administrative goal is a design objective. The task in developing a regulatory regime is to strike a proper balance among objectives, keeping in mind the priority to be given each objective. Thus, while the design objective suggests simplicity is the key, pursuit of this criterion to the exclusion of the more fundamental goals of fishery management would not be acceptable.

The task of the Working Group was to translate these conceptual goals into operational terms which best address the circumstances of the Great Bear Lake fishery. This was facilitated to some extent by a review of and adherence to the basic biological and economic principles of fishery management. In it's deliberations, the Working Group considered the priority given the economic development needs of the Satudene and the potential implications of land claim negotiations.

DOMESTIC FISHERY

RECOMMENDATIONS

Recommended Goals

- The domestic fishery of the Satudene is assigned the highest priority in use. The first requirement of a management plan, subject only to the needs of conservation, is to ensure sufficient fish resources are available for domestic use.

Recommended Strategy

- The Working Group feels the present management strategy is the most practical means of providing fish resources for domestic use and therefore recommends it's continued use in preference to a more regulated system of fishing.

RATIONALE

The present management strategy is to rely on very flexible arrangements to provide fish resources for domestic harvesters. The Satudene are not restricted in their domestic fishing activity, other than the limitation that, by definition, domestic fishing be for food use but not for sale or barter. At the same time, while there are no regulations which exclude lodge guests from fishing in traditional domestic fishing areas, there has been an understanding these areas would be respected by the lodge operators. In this way, any conflicts which may arise from the presence of lodge guests in domestic fishing areas have generally been avoided.

An alternative to the status quo is a more regulated system of domestic fishing. This might be achieved by several means, such as the creation of restricted domestic fishing zones, the provision of guaranteed harvest levels, or the use of travel permits to traditional domestic areas. While each of these has it's advantages and disadvantages, it is necessary to ensure there is a need for such measures and to consult with the Satudene regarding their potential.

Acceptance of the recommendation below that the Keith Arm and portions of the McVicar Arm be reserved pending the development plans of the Satudene will have the coincidental effect of eliminating conflicts between domestic harvesters and lodge clientele in many of the traditional domestic fishing areas. Necessarily, a decision to reserve this area of the lake will also require the Satudene, as their development planning proceeds, to consider any trade-offs between domestic fishing and other choices of use.

The Working Group does not support the request of the Satudene for the creation of domestic fishing zones within a 10 mile radius of all existing outpost cabins.There is no biological basis for moving to such a formal system, since there is no evidence that angling has adversely affected the supply of fish resources for domestic needs. There is also no indication of overfishing by domestic harvesters, hence no requirement to consider limits on harvest levels to ensure the conservation of fish resources. The Working Group feels any conflicts that exist are more perceived than real.

Because there is no biological basis for conflict, the Working Group feels the costs of regulation and enforcement may very easily outstrip the benefits of eliminating perceived conflicts in use. A move to regulate for domestic fishing may also make it difficult to consider other development potential, even if these proposals were made by the Satudene.

Rather than moving to the regulatory approach at this time, the Working Group feels conflicts can be avoided if each resource use group respects the needs of the other. The Working Group urges the lodge industry to respect all historic domestic fishing areas, including the existing outcamps of the Satudene (Figure 1). In this same spirit of cooperation, the Working Group urges the Satudene, in their selection of areas and timing of domestic fishing activity, to respect the operational requirements of the lodge industry.

Should there be a reluctance of resource users to respect the needs of each other, there will be no alternative but to move to a system of regulated fishing zones. But such a move should be considered in light of it's merits since enforcement can be so costly to resource users and the general taxpayer in relation to the benefits provided.

Acceptance of the Working Group's recommendation for a monitoring system for all resource uses (recommendations below) should provide a sufficient information base to evaluate any future conflicts in the traditional domestic fishing areas.

LODGE-ACCESS SPORT FISHERY

RECOMMENDATIONS

Recommended Goals

- The Working Group recommends that, subject to the requirements of conservation and the domestic fishing needs of the Satudene, the management goal should be to sustain the sport fishery as the best-use of the lake trout stocks of Great Bear Lake.

- Great Bear Lake's sport fishery should be managed to maintain the yield of fewer, larger fish in preference to a goal of maximizing the sustainable yields which would provide more, but smaller fish.

- The Working Group recommends, at minimum, the fishing quality goal for Great Bear Lake should be to provide for sustained harvests of lake trout longer than 700 mm.

- The Great Bear Lake sport fishery should be managed to provide a direct economic return for the resource owners.

Recommended Strategy

- The Working Group recommends the development of a Great Bear Lake sport fishing licence system as the most effective means of managing the Great Bear Lake sport fishery for high quality angling.

- In order to ensure the recommended goal for fishing quality be achieved, the Working Group recommends the existing lodges be provided an initial allocation of Great Bear Lake sport fishing licences. This initial allocation should not exceed their present seasonal licensed capacity.

- In order to ensure the recommended goal for fishing quality be achieved, the Working Group recommends the existing restrictions on bed capacity be retained and their intent clarified.

- The Working Group recommends that no further restrictions be considered at this time to resolve conflicts among the lodges over their traditional areas of operation.

- In order to ensure the sport fishery provides a contribution to the costs of management and that an economic rent be earned for the resource owners, the Working Group recommends a licence price be charged which better reflects the value of the right of access to a public resource being managed for high quality recreation opportunity.

RATIONALE

Rationale for goals

Lodge-access sport fishing, presently the largest fishery on the lake, has and no doubt will continue to be the best-use alternative of the lake trout stocks of Great Bear Lake. The requirement of a management plan, once sufficient resources are provided for domestic use, is to address the resource management and economic development issues of this fishery.

There is general agreement among the lodge industry, the community of Fort Franklin and the Working Group that the lodge-access fishery should be managed with the objective of maintaining high quality angling.

Biological investigations of yield-effort relationships suggest the lake could be managed for a range of fishing quality attributes consistent with the resource conservation goal. For example, in it's interim report the Working Group indicated the need to choose between a strategy of maximizing the yield of larger fish or of maximizing the sustainable yield, resulting in harvests of more, but smaller fish. The requirement is to select which fishing quality attributes are best and to manage the fishery so that this fishing quality can be sustained.

The Working Group also tried to establish an objective measure of the admittedly subjective concept of "high quality trophy angling". Two alternatives for trophy fishing quality were considered. The first would provide for maximum harvests of lake trout longer than 700 mm, this quality of fishing felt to be consistent with the current levels of fishing effort and harvest. The second would provide for maximum harvests of lake trout longer than 900 mm, a quality of fishing which could only be achieved over time as a result of an estimated 50% reduction in current fishing pressure.

The Working Group, in recommending a minimum fishing quality, has considered the continuity of operation of the existing lodges and the stability of the numbers of lodge clientele as one indication of the market acceptance of the present fishing quality of Great Bear Lake. Despite this, there are also indications that some anglers seek even larger size trophy fish then are generally available. The expansion of fishing activity to more remote areas by fly-outs and through the use of outpost camps appears to give credence to this demand. Ideally, the Working Group would have liked to address the issue and advise on an "economically optimal" fishing quality. This would require assessment of the extent of the demand for trophy lake trout longer than 700 mm and the economic implications of a reduction in fishing pressure to achieve a higher fishing quality. Unfortunately, such analysis is not possible using the information presently available. The Working Group acknowledges it is advising from less than an ideal position. Nevertheless, there was enough general agreement that the minimum quality goal of sustained harvests of lake trout longer than 700 mm should be recommended.

The management process proposed by the Working Group should enable evaluation of the desirability of seeking higher quality fishing. A monitoring system for the lodge-access fishery (recommendation below) and an Advisory Committee which includes representation of the lodge industry (recommendation

below) are considered essential elements of an effective management process. The monitoring system should provide sufficient information to assess whether or not the resource conservation and desired fishing quality goals are being met. Consultation with the lodge industry is equally important in order to assess whether or not changes in angler preferences or industry operating conditions require changes to the goal for fishing quality.

The Working Group, in it's interim report, discussed the concept of economic rent from the fishery as an indicator of an economically efficient fishery. In spite of the stated opposition by the lodge industry to any economic measures which would provide a return for the resource owners, the Working Group views the development of a system to provide rent an essential long-term goal for the Great Bear Lake fishery. The recommendations presented in this report, all leading to a more intensive resource management program for the lake, will not be costless. Because of this, it is considered all the more necessary for other than nominal prices to be charged for fishing rights. Economic regulation of the fishery should provide a mechanism to price access to the fishery in a way which ensures management costs are covered and the rent potential is achieved.

Rationale for strategy

The existing management strategy for the lodge-access fishery is to control the numbers and bed capacities of the lodges and to place special catch and possession limits on each angler. The regulation of bed capacity, given assumptions of the normal operating season and normal duration of stay of lodge clientele, has provided an indirect control on angling pressure. The angling regulations limit the harvests by each angler and determine the licence fees to be paid for access to the fishery.

The alternatives to the status quo discussed by the Working Group in it's interim report included the use of licences and licence fees, licences and a royalty on trophy fish harvests, and the development of leased fishing rights. In subsequent meetings, there was consideration of the use of zoning and various combinations of the above-mentioned policy instruments.

The Working Group is of the opinion there are sufficient limitations with the status quo that changes are required. The present licence system does not provide an accurate measure of the numbers of lodge-access anglers on the lake, since there is no one to one correspondence between licence sales and lodge clientele. The use of bed capacity as a principal means of controlling fishing effort is considered too indirect a method to ensure the necessary effects if Great Bear Lake is to be managed for high quality angling. Should rotation patterns of the lodges change, the use of bed capacity will be an increasingly ineffective measure. There has been concern with overlap in use both between lodges and the community and among the lodges themselves. The system is also not suited to the monitoring of use patterns or controlling the extent of itinerant angling activity on the lake. Finally, because only nominal prices are charged for a licence, the goal of Fisheries and Oceans to provide an economic rent to the owners of the resource is not being achieved.

While thorough evaluation of the details of a licensing system awaits acceptance of the recommendation in principle, the Working Group did feel it important to describe in general the licence system it proposes and to

highlight some of the considerations which led to the recommendation for a licence and licence fee system.

The proposed licence would be specific to Great Bear Lake and would be required by both lodge-access and itinerant anglers. As an interim measure, the Working Group feels that the licence should provide for catch and possession limits as presently stated in the Northwest Territories Fisheries Regulations. As the management program evolves, it should be feasible to calibrate the regulatory system so that the number of licences and the individual catch and possession limits are consistent with current biological assessments. The price of the licence requires further assessment pending acceptance of the recommendation in principle.

The Working Group evaluated the licence alternative to ensure it would be suited to the goals for fishery management with respect to resource conservation and fishing quality, economic efficiency, economic rent, and the requirements for administrative ease and efficiency.

Resource conservation/preservation of fishing quality - a licence system is considered to be a very effective means to ensure the resource conservation and fishing quality goals can be achieved. A licence limitation scheme would control directly the number of anglers permitted to fish Great Bear Lake. In combination with individual catch and possession limits, it should be possible to respond to changing biological conditions in the fishery.

It will also be feasible to adapt the licence system to aid monitoring of fish harvests and the enforcement of regulations. Tags for retained lake trout could be included with each licence and anglers could be required to attach the tag to lake trout retained as trophy, take-home or shore lunch fish. While there are some obvious practical difficulties in developing a tag system (i.e. how would the department enforce the tagging of fish for shore lunch use ?), the Working Group recognized the benefits such a system could offer as a direct and inexpensive control on all fish harvested. The Working Group also felt that most anglers, given their concern for resource conservation, would support the implementation of a tag system.

Economic efficiency/resource rent - an economically efficient non-resident lodge-access fishery is one in which the difference between total benefits (lodge revenues plus licence revenues) and total costs (lodge expenses and resource management costs) is as large as possible. This difference between revenues and expenses, the so-called net economic benefit, is the economic rent of the fishery. Economic rent is the surplus which is attributable to the fact that nature has provided a resource free of charge which contributes to a highly valued recreation experience.

There are some tangible economic indicators which should be used to assess the economic status of the resource management program. An economically efficient lodge-access fishery would provide access to anglers who value the recreation sufficiently that they are willing and able to pay an amount which generates adequate revenues for:

1. the lodges to cover their costs of operation including a normal profit on their capital investments;

2. the resource management agency to cover it's costs of managing the fishery;

3. the resource owners to receive an economic return for the fish resources provided anglers.

The Working Group, in proposing the licence and licence fee alternative, is of the opinion the Great Bear Lake fishery is sufficiently valued by anglers that it should be feasible to achieve all of the above-noted economic indicators. While there will be legitimate debate as to whether this can be done immediately or whether it has to be phased in gradually, there should be less debate that for the long-term they are valid goals and should be pursued. Over time, growth in demand and the preservation of Great Bear Lake as a high quality fishing site in a system where few lakes are being managed as intensively as proposed by the Working Group, should contribute to the preservation of an economically valuable fishery.

The principle suggested by the Working Group is that if Great Bear Lake is being preserved as a high quality recreation site those who use the fishery should pay for the benefits provided. While the principle of "user pay" is clear, there is also a need to consider economic regulation of the fishery very carefully. The first concern is that because most of the lodges purchase licences for their clientele as a part of the fishing package, it might be argued a licence fee would be a direct tax on the lodges but not on the anglers. The Working Group suggests this is not a plausible outcome. First, the incidence of the licence fee could be borne by anglers if lodges changed the basis by which their services were offered to exclude licence fees. In the event that the lodges prefer to retain all-inclusive package services the burden of the licence fee can be passed to lodge clientele in the form of higher package prices. In suggesting this course of action the Working Group hypothesizes any price increase will produce a much less than proportional decrease in the number of anglers seeking access i.e. the demand is highly price inelastic in the range of prices which might be considered.

A second concern is that a licence limitation scheme for the lodges may constrain the efficiency of their operations. While there may yet be difficult adjustments for the industry if it becomes evident that a higher quality fishing goal than presently suggested should be pursued, the immediate proposal should pose no problems. The Working Group has proposed each lodge be restricted to serve the number of clientele consistent with their current licensed capacity. In this sense, substitution of indirect controls on beds with the direct controls on licence numbers should be transparent, since the intent (if not the effect) of the bed capacity limitation has always been clear. Because the initial licence allocation will be commensurate with the existing investments in bed capacity, the allocation scheme should not adversely affect lodge operating efficiency.

The Working Group is also concerned with the possible distortions which might arise if the pricing system for Great Bear Lake were developed in isolation of other fisheries in the NWT and in other jurisdictions. However, whereas the industry has expressed the view that a pricing system should be applied uniformly across all lodge-access fisheries in the NWT, the Working Group suggests this is not an acceptable starting point. As in most markets, products of differing quality command different prices. This market principle

should apply to public sector pricing of access to fishing sites as well i.e. high quality sites should command high prices, low quality sites low prices. Hence the need to consider a differential pricing system for the NWT with uniform prices for each class of comparable fishing sites i.e. Great Bear Lake might be grouped with Great Slave Lake, lodges in the Keewatin might be grouped together, lodges in the Hay River-Yellowknife area, etc.

In the event there is a requirement for changes in the allowable fishing effort, the use of the price system to ration limited fishing rights should be considered as an economically efficient means to handle adjustments in the numbers of anglers to be allowed on the lake.

A truly efficient system of rationing scarce fishing rights would also be sufficiently flexible that licence numbers might be transferable among the lodges as a means of responding to changing biological and economic conditions. While the Working Group has noted the desirability of such a system, it is viewed as a refinement of the management process which could be pursued once the basic workings of the licence and licence fee system were better understood.

Administrative efficiency - the appeal of the licence system alternative is that it should be relatively straightforward to implement. A licence system presently exists, so the requirement is to extend and adapt this system to the circumstances of Great Bear Lake. The existence of special licence systems in other jurisdictions, such as the Trophy Lake Licence in the Province of Alberta, suggests the proposed licence system is administratively and operationally feasible. Relative to other alternatives, such as the use of royalties on trophy harvests, the licence alternative is felt to be less costly to administer.

There are many details to be examined if the decision is made to accept the licence system proposal. In addition to the concerns already noted, it would be necessary to select the method by which licences would be distributed, to integrate with the existing licence system to allow for outpost trips to other lakes in the NWT, and to consider alternatives for the licensing of lodge staff. While these are important considerations, the Working Group felt them to be distinct and manageable issues which should not detract from the potential of the licence proposal as a direct control on fishing pressure.

The Working Group stresses the potential of a tag system as an aid to the fishery management and enforcement process. At a minimum, given the emphasis on trophy fishing, it would be useful to consider tags for all retained lake trout of trophy harvest size. Preferably, the tag system could be developed for all fish retained, but given the potential complications of such a system, the Working Group felt it best to proceed slowly and leave such refinements for longer term application. Therefore, the Working Group felt that, at this time, refinements of the licence system such as a trophy tag should not be recommended. The need to keep the system as simple as possible to ensure that it can be administered is the basis for this position. This does not preclude development of the tag system at any future date.

As an alternative, the Working Group prefers continued use of bed capacity restrictions as an indirect control on fishing effort and shore lunch

use by lodge clientele. For this system to work more effectively, the Working Group noted the need to specify in regulations that bed capacity be interpreted as the equivalent of 7 days stay, even if the duration of stay is less than 7 days. This change should serve to clarify the intent of the bed capacity restriction, at the same time achieving the desired effect of providing an indirect control on lodge-access fishing effort and fish harvests.

The Working Group felt that, at this time, the development of any further restrictions on the areas fished by the lodges should not be proposed. Rather, as with the past, the Working Group proposes the informal agreements of the lodges to respect each others areas of operation be continued. In the event that serious problems with this approach are encountered in the future, it will be necessary to consider the regulatory mechanisms to delineate areas of operation for each lodge.

The Working Group, in taking this position, does not support the request of the Satudene to "return" to the 1970 distribution of angling. The 1984 estimate of angling activity, excepting the incursions to the Keith Arm, suggested a more restricted fishery than noted in earlier years. However, the Working Group stresses that all reported patterns merely reflect estimates made from periodic checks of the fishery. Because they are not the product of a detailed monitoring program, they must be interpreted carefully. Until such time as a monitoring program is put in place which generates hard data on areas fished, the Working Group felt it premature to consider regulation of the distribution of fishing effort as requested by the Satudene.

ITINERANT SPORT FISHERY

RECOMMENDATION

- The Working Group recommends that itinerant anglers also be required to obtain a Great Bear Lake sport fishing licence and that the same price, terms and conditions be applied to all anglers.

RATIONALE

In it's interim report the Working Group described the need to have some form of direct control on total fishing effort in order to maintain sport fishing quality. For this principle to be applied effectively, it would be necessary to include itinerant fishing activity in total allowable fishing effort and to regulate the fishery accordingly.

The alternative is to leave this fishery unregulated until such time as it's dimensions were felt to be significant enough that regulation were warranted.

The rationale in recommending regulation of the itinerant sector is, first and foremost, to establish the means of monitoring the dimensions and trends in use patterns of this sector. Second of all, this system will allow for controls on the harvests of "trophy" fish by itinerants immediately. For the long-term, this system will provide the basis to assess whether or not the dimensions of the itinerant sport fishery are such that itinerant fishing pressure should be included in the overall controls of fishing pressure.

The advantages of controls on this sector, of course must be balanced with the increased costs of administration and enforcement. In accepting the Working Group's recommendation to control the itinerant angling sector, it must be emphasized to the Department of Fisheries and Oceans and the Department of Renewable Resources they will be facing higher program costs.

This proposal may also be resisted by resident anglers who feel they should have unrestricted access to fishing opportunity throughout the NWT at the nominal fees of the present licence. Should this recommendation be accepted, it will be important to convey to resident anglers the rationale in controlling all fishing as a necessary measure to preserve the recreation quality of Great Bear Lake. Uniform pricing of access is felt to be consistent with the concept of ensuring those who benefit from the intensive management of the lake contribute directly to the costs of the management program.

COMMUNITY ECONOMIC DEVELOPMENT

RECOMMENDATIONS

Development Goals

- A fishery management plan should accommodate the economic development goals of the Satudene, subject to the above stated resource management goals.

Development Strategy

- The Keith Arm and a portion of the McVicar Arm (Figure 2) should be reserved for the future economic development of the community of Fort Franklin. No lodge-access fishing should be allowed in these areas pending the development of a long-term fishing plan by the community.

- The Working Group recommends that the Department of Fisheries and Oceans and the Department of Economic Development and Tourism evaluate the regulatory means of ensuring the Keith Arm and portions of the McVicar Arm be reserved so the community of Fort Franklin may pursue it's economic development plans.

Sport fishery development

- The Working Group recommends that any further development of the lodge-access sport fishery should be consistent with the management goals for the lake. As well, proponents of development should be required to prepare a formal proposal for the participating Federal and Territorial agencies and their Advisory Committee which demonstrates 1) the availability of a sustainable supply of fish resources to support the development proposal, 2) the relationship to other choices of use i.e. potential impacts on domestic and sport fisheries and 3) the feasibility of the development proposal.

- The Working Group recommends the Department of Economic Development and Tourism evaluate the suggestions for guide training made by the community and the willingness of the industry to provide such training and, pending the development plans of the Satudene, implement a lodge employment training program for the community of Fort Franklin.

- The Working Group recommends the Department of Economic Development and Tourism address the concerns raised by the community of Fort Franklin with respect to guide training requirements, plant safety inspections and water safety training for all guides.

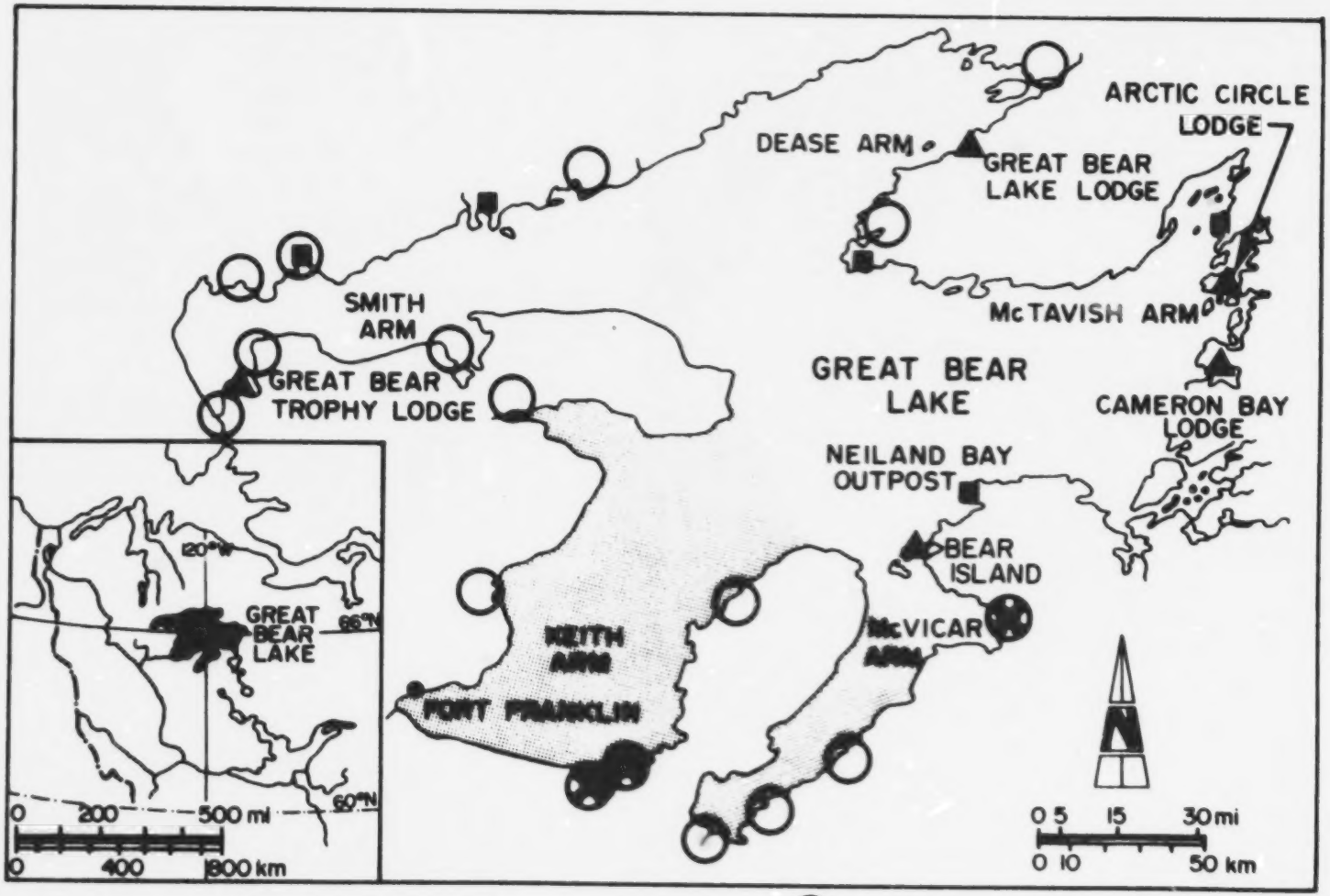

Figure 2. Area proposed to be reserved pending the economic development plans of the Satudene.

Commercial fishery development

- The Working Group recommends that any development proposal for commercial fisheries for either export or intra-community trade be consistent with the management goals for the fishery. Proponents of development should also be required to prepare a formal proposal for the participating agencies and their Advisory Committee which addresses the availability of fish resources, the relationship to other uses, and the feasibility of development.

- The Working Group recommends small-scale commercial fishery development, based on surplus fish harvests, should be allowed without formal review.

- The Working Group recommends the Department of Fisheries and Oceans develop a system to monitor use patterns of any small-scale fishery development.

RATIONALE

The Working Group, in it's deliberations, accepted the needs of the Satudene to derive economic benefit from Great Bear Lake and the priority assigned to those needs by all participating agencies.

Sport fishery

While earlier discussion has focused on the resource management requirements to sustain the existing lodge industry, the following discussion reflects the Working Group's deliberations on how the Satudene's economic development goals could be integrated with the proposed resource management goal of allocating lake trout stocks to their best-use alternative in sport fish use.

There are several development alternatives which the Satudene may consider as a means of achieving economic benefit from Great Bear Lake's sport fishery. First, as suggested in the Working Group's interim report, there is a need to assess the sport fish potential of the Keith Arm. Depending on the availability of a sufficient supply of fish resources in the Keith Arm and the economics of different scales of investment in bed capacity, it may be feasible to pursue development using some combination of the existing hotel complex, the now-dormant Sah Tew lodge, and additional outpost bed capacity elsewhere in the Keith Arm (both Deerpass Bay and Preble Bay appear to be attractive angling areas).

The alternative to expansion of bed capacity in the Keith Arm is for the community of Fort Franklin to pursue joint ventures with existing lodges and to propose use of the Keith Arm as a means of augmenting the recreation opportunity.

The possibility of share or outright purchase of an existing lodge operation offers yet another means for the community to become directly involved in the lodge-access fishery.

The need to consider the potential for increased employment and regional income for the north has been a long-standing concern throughout the NWT. The willingness of the lodges to take on a larger percentage of Dene staff if government provides funds for the lodges to do their own guide and staff training is another opportunity which could be considered as a means of creating seasonal employment opportunity for the Satudene.

In the event the Satudene prefer not to be directly involved in the lodge industry, they will have restricted their development options significantly. Remaining alternatives to obtain benefit from lodge-access fishing may arise through the land claims process. However, any speculation or commentary by the Working Group about the negotiations or their potential outcomes would not be appropriate.

While these are the development alternatives the Working Group identified, it must be emphasized it is for the Satudene to consider which are compatible with their long-term interests and to initiate the proposals which they feel best achieve their economic development aspirations.

The Working Group notes with concern the expansion of lodges into areas where, although no formal exclusions exist, there has been general understanding since the decisions made by Commissioner Hodgson in the late 1960's that no further development would occur. The community, in it's original proposal to develop a commercial fishery, indicated it's desire to obtain economic benefit from the lake. In response, the Working Group identified that under present conditions the financial prospects for development were extremely unfavourable. But at the same time the Working Group did encourage the community to consider sport fish potential of the Keith Arm as an alternative, more viable means of obtaining direct economic benefit from the lake. In light of the recent expansion of the lodges into the Keith Arm, the Working Group expresses it's concern that development opportunities for the community may be diminished. The reason for this is that while sport fish development is considered a preferred development path, any cropping of the larger sized fish which may be found in these largely unexploited areas may adversely affect the ability of the community to develop a sport fish operation.

The community of Fort Franklin, in it's response to the Working Group's interim report, interpreted Commissioner Hodgson's decision that there would be no more development of sport fishing lodges on Great Bear Lake to also mean that Keith and McVicar Arms would be reserved for their development. Unfortunately, whatever assurances the community leaders may have been given at the time, there is no written record of this policy decision or it's intent. Regardless of what was said at the time, the Working Group is of the opinion that if the "spirit" of the Hodgson policy was to ensure the community would benefit from the lake, this intention is an objective which Government should endorse.

The review process will provide a sound basis upon which future decisions can be made on the allocation of fish resources for lodge-access fisheries development. The Working Group emphasizes that for the long-term goals of fishery management to be achieved that it is essential that any development proposal satisfy all suggested review criteria.

In it's interim report, the Working Group also identified the need to consider the potential for increased employment for residents of the NWT and a shift towards increased purchases of material supplies in the north. The lodge industry has correctly pointed out that regulation to achieve a shift in employment and regional income patterns would be economically inefficient and, therefore, oppposed any regulation of the industry for this purpose. The Working Group shares the view that such regulation should not be pursued, our concern being not only with efficiency but also with the constitutionality of such regulations.

At the same time, the lodge industry has acknowledged the need for increased local employment and benefits. While the need to ensure that lodge clientele be provided with high quality service, and that past experience in hiring northerners has not always resulted in quality service, the lodge industry has indicated a willingness to take on a larger percentage of Dene staff if Government provides funds for lodges to do their own guide training programs.

The Working Group also notes that for the community of Fort Franklin to achieve economic benefits from Great Bear Lake's lodge-access fishery it will be necessary to obtain training opportunity in all aspects of lodge operation. Only at such time as skills will be improved can a more direct link between lodge activity and community benefits be made. This requirement will exist whichever route the community chooses to follow in developing it's economic opportunity, whether employment in existing lodges, development of the Sah Tew lodge, or joint ventures/purchase of existing lodge capacity.

The Satudene requested action to address their concerns with guide training, plant safety inspections and water safety training for all guides. This concern was accentuated by reference to the tragic drowning of a Great Bear Lake guide during the 1984 season. The Working Group acknowledges the concerns of the Satudene and urges the Department of Economic Development and Tourism to examine the issues thoroughly.

With respect to the request of the Satudene that guides be trained in recording and transmitting data, since it is first necessary to agree on the kind of monitoring program to be implemented, the Working Group considers this request to be pending. More problematic is the suggestion that guides be held accountable for ensuring catch and possession limits not be exceeded. Unless guides were legally vested with the right to enforce fishery regulations, it is not practical to suggest guides be held accountable for something over which they have no responsibility. The Working Group felt this idea needs to be developed more clearly before it can be evaluated properly.

Commercial Fishery

The Working Group, in it's interim report, conducted a preliminary feasibility analysis of commercial fishing development potential. This analysis suggested that, under present conditions, a whitefish fishery harvesting for export markets is not likely to be financially viable. In light of the views offered by the community in response to the interim report, there appears to be agreement that commercial fishery development is not a preferred development option.

The Working Group must also emphasize that development of a commercial fishery for inter-settlement trade, while not facing as difficult a situation, must also overcome some significant constraints. The limited nature of markets in regions where alternate sources of supply are generally available, the high costs of transportation from fishing grounds to Fort Franklin and from the community to other settlements in the north are considered to be major impediments to development. Accordingly, the Working Group offers the opinion that commercial fisheries development, whether for export out of the N.W.T. or for inter-settlement trade, is not a preferred development option under present conditions.

As markets, prices and costs change, the prospects for commercial fisheries development may also change. The Working Group recommends the review process to allow for consideration of development potential in the future. This process should provide a basis for decisions on the allocation of fish resources for commercial fisheries development. The Working Group emphasizes that for the long-term goals of fishery management to be achieved that it is essential that any development proposal satisfy all criteria. Should it become evident that a proposal cannot meet all these criteria, the merits of pursuing the development will warrant careful scrutiny. In the event there is not a sufficient supply of resources, it is clear the development should not be supported. In the event the resources are there and the impacts on other uses are not a constraint, but the development is not viable, economic criteria would also lead to a decision that the proposal not proceed. Presentation of this information would indicate to decision-makers the financial and economic costs of pursuing development in order to achieve social benefits, a trade-off which they alone are in a position to evaluate.

The Working Group also considered small-scale commercial fishery development for local sales. In proposing that local sales be allowed, the Working Group felt it preferable to make legitimate the peddling of small volumes of fish which presently exists on the lake. While there can be no unambiguous definition of what constitutes "surplus" fish harvests, it should be clear that such a fishery would relate to small volumes of fish and would require no additional capital investments in harvesting or plant capacity.

In order to establish the dimensions and use patterns in this fishery, the Working Group has recommended the development of a monitoring system for the fishery.

MANAGEMENT PROCESS

RECOMMENDATIONS

Advisory Committee

- To ensure that both Government and resource users are aware of the status of the fishery and the criteria by which decisions regarding resource use and allocation are made, the Working Group recommends that an Advisory Committee be formed to advise the participating Federal and Territorial agencies in the conduct of their fishery management and economic development programs for Great Bear Lake.

- The Working Group recommends the membership of the Advisory Committee should include one member from each of the community of Fort Franklin, the lodge industry, Fisheries and Oceans, Economic Development and Tourism, and Renewable Resources. A non-voting chairperson from within the Advisory Committee should be appointed on a rotating basis and a permanent secretary should be appointed to the Committee.

Coordination of Agency Programs

- To ensure that financial assistance programs for resource use on Great Bear Lake are coordinated with the long-term management plans for the fishery, the Working Group recommends that the participating agencies and their Advisory Committee be fully informed of Federal and Territorial program proposals which relate to Great Bear Lake.

Management Information Systems

- To ensure that a sufficient database is available to assess the status of the lodge-access sport fishery, the Working Group recommends that the Department of Fisheries and Oceans, in cooperation with the lodge industry, design and implement a lodge harvest reporting system as an essential requirement for a long-term fishery management program.

- To ensure that a sufficient database is available to assess how the domestic fishing needs of the Satudene are being met, the Working Group recommends that the Department of Fisheries and Oceans, in cooperation with the community of Fort Franklin, design and implement a domestic fishing harvest reporting system.

- To ensure monitoring of the numbers of lodge clientele who fish Great Bear Lake until such time as the recommended licensing system can be put in place, the Working Group recommends that the Department of Economic Development and Tourism obtain a certified copy of each lodge's guest book including the information on the licence numbers of those guests licensed to fish and a record of all lodge staff licensed to fish.

- To ensure a sufficient understanding of the biology of the fish stocks of Great Bear Lake, the Working Group recommends that the Department of Fisheries and Oceans commit the resources to conduct basic biological investigations of Great Bear Lake in conjunction with the above recommended monitoring program.

- The Working Group recommends proponents of development solicit financial support of Federal and Territorial financial assistance programs, such as the Economic Development Agreement, to expedite the biological investigations necessary for any proposed fisheries development on Great Bear Lake.

- The Working Group recommends that the Department of Fisheries and Oceans commit additional financial resources to the enforcement of the Great Bear Lake sport fishery.

RATIONALE

The Working Group views the completion of it's task as an important first step in the development of a fishery management plan for Great Bear Lake, but it must be emphasized that the work is no more than a first step in the management process. In order to achieve an effective fishery management plan, there will have to be a firm commitment of the participating agencies to provide sufficient research, monitoring and evaluation of the fishery to ensure that whatever goals are established for the fishery can be achieved. While the Working Group has endeavoured to consult with resource users and allowed them to develop their views on the future management of the lake, it is critical they be brought more directly into any further deliberations of a management plan so that consensus on the best course of action can be achieved. It is equally important that the agencies responsible for resource and economic development continue the cooperative efforts they have started with the formation of the Working Group in order that their programs can be effectively coordinated.

The recommendations above are presented as a reflection of the Working Group's views of the minimum, essential elements of a fishery management system for Great Bear Lake. Both resource user groups, as noted in the appendices of Volume 2, seek added commitments to a long-term fishery management program.

Although efforts have been made to keep interested parties fully informed of the deliberations of the Working Group and to provide financial support so they may develop their own positions, both the community of Fort Franklin and the lodge industry have been critical of their limited involvement in the development of a management plan. Insofar as the Working Group has conducted some of the necessary background work, it is now considered timely and essential that resource users be more directly involved in any further discussions of a management plan.

While the full responsibilities of the Advisory Committee remain to be worked out, the Working Group envisions a system where the participating agencies present the Advisory Committee with their program proposals and the

Advisory Committee reviews and comments on the plans. The Committee would also be a good mechanism to incorporate resource users' views about the status of the fishery into future management programs and further development proposals.

The Working Group felt a rotating chairmanship was desirable, given that no single agency dominates the management process for the lake. For such a system to work effectively, the agency or resource user group which has the chair should be authorized to appoint an alternate to represent their agency or group for the period they have the chair. A permanent secretary to the Advisory Committee would provide continuity and ensure the orderly reporting of the Committee's deliberations. Fisheries and Oceans has indicated a willingness to absorb this expense.

The need for all levels of government to coordinate the delivery of their programs is an obvious requirement, yet in too many other situations programs have worked at cross-purposes with little net benefit to those whom the programs are intended to serve. Thus, while it is an obvious requirement, the Working Group felt it essential to stress the need to ensure the coordination of government programming with the management process.

Earlier, in it's review of each fishery, the Working Group recommended the specific means of coordinating agency programs to achieve the management goals for Great Bear Lake. In this section, special reference is made to the issue of financial assistance programs as an area where close coordination is most essential. Recommendations on the coordination of agency programs are restricted to the issue of financial assistance programs, since this is the one area where cooperation is most essential. Many other opportunities will exist as the management program unfolds and the Working Group is hopeful these opportunities will not escape the agencies participating in this review. For example, once decisions are made on the best means to monitor the fishery, Fisheries and Oceans should be able to cooperate with DINA and GNWT to develop necessary training programs for the community and the lodges. Furthermore, if a decision is made to manage the lake intensively for high quality recreation, this could be integrated with Economic Development and Tourism's marketing and promotion programs to stress Great Bear Lake is an intensively managed, limited-access wilderness recreation area.

A monitoring program for all resource uses is considered to be an essential requirement for effective management of the fishery. The Working Group, while stressing the need for a monitoring program, cannot endorse the specific recommendations of the community of Fort Franklin as to how the monitoring of the lodge-access sport fishery should be done. The Department of Fisheries and Oceans is presently conducting an evaluation of monitoring alternatives, in which some of the lodges on Great Bear Lake have willingly assisted. These alternatives include the use of a guide reporting system (very similar to what the community has proposed) and the use of an angler diary reporting system. While pilot projects have been initiated because they offer cost-effective alternatives to the more conventional creel census system of monitoring, they also pose statistical problems which must be evaluated. It must also be emphasized that the Working Group has not dismissed the use of a rotating creel and biological investigation system as partial and therefore ineffective. A carefully designed sampling program based on periodic, intensive investigations may be a cost-effective and statistically reliable alternative to an enumeration program of angler catch and effort. As the

evaluation of alternatives is still in progress, the Working Group felt it most appropriate to allow the Department of Fisheries and Oceans to complete it's studies at which time it should propose how best to proceed.

With respect to the domestic fish harvest reporting system, the Working Group identified the need to gain some better appreciation of the extent of this fishery and how it's needs were being met. A domestic reporting system should provide basic information on the number of participants, the fishing effort and harvests by species and areas fished. The working group is concerned that a very intensive domestic harvesting study, as presently is being conducted in other parts of the NWT, would be costly relative to the essential needs for the Great Bear Lake fishery. Accordingly, the Working Group emphasizes it's concern that any system developed should be a cost-effective means of obtaining basic information.

The Working Group also emphasizes the need for biological assessments as part of an effective management process. While the Working Group is not recommending the commitment of additional resources for a large-scale research program, there are some basic and essential needs which must be addressed. Present initiatives by Fisheries and Oceans, which have been pursued to augment the rotating creel census program, include the development of data on the size of fish exploited by specific areas of the lake, the development of harvest estimates by specific areas, and the development of data on the size and age of fish communities in the currently exploited areas.

The need to gain an appreciation of the fish communities of the Keith and McVicar Arms will be an essential requirement as the Satudene pursue their economic development planning. To alleviate any financial constraints which may delay the start of needed biological investigations, the Working Group has made reference to Federal and Territorial financial assistance programs, including the Economic Development Agreement, as a means of securing the funds to proceed.

In setting priorities, the Working Group has accepted the advice of Fisheries and Oceans biologists that priority should be given to research in understanding the basic biology of fishes (i.e. fish community patterns) as well as the specific effects of exploitation on those fish stocks (i.e. catch/release mortality). Evaluation of the effect of landing and releasing lake trout is acknowledged to be important, since there is so much emphasis on catch and release fishing in this fishery and earlier investigations were considered preliminary.

The Working Group, in recommending a higher priority be given to the enforcement activity on Great Bear Lake has mainly considered the increased requirements for enforcement if the proposed licence alternative is to be effective in controlling fishing pressure from both lodge-access and itinerant fishermen. Development of a small-scale commercial fishery will also require added enforcement activity.

Volume

2

REVIEW OF GREAT BEAR LAKE FISHERY MANAGEMENT GOALS

Volume 2
August, 1985

Northwest Territories
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Canada

REVIEW OF GREAT BEAR LAKE

FISHERY MANAGEMENT GOALS

- Volume 2 Appendices -

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Appendix 1

Terms of Reference

June 22, 1983

TERMS OF REFERENCE
REVIEW OF GREAT BEAR LAKE
FISHERY MANAGEMENT GOALS

Statement of Issue

The Department of Fisheries and Oceans is responsible for the management of the fishery resources of the Northwest Territories on behalf of the owners of these resources, the people of Canada. The Department is concerned that the fishery resources are conserved and that they make the greatest possible contribution to the economic and social welfare of Canada.

The existing management strategy accommodates domestic fishing and sport fishing use of Great Bear Lake. The Department recognizes the importance of the fishery to native groups for a source of food and for their culture. Accordingly, the first priority of use is the domestic fishery. The Department has defined domestic fishing rights to mean that natives have a right to fish for food use but not for sale or barter. Furthermore, this fishery is considered to be second only to the priority that the fishery resource be conserved.

There is also a sport fishery on the lake. While some anglers arrange their travel to Great Bear Lake independently, the majority of anglers obtain access to Great Bear Lake through the five (5) well developed sport fishing lodges. In addition, there is one lodge which is inactive. To date, the Department has managed the sport fishery as a trophy fishery of the highest quality. This has been achieved through such management initiatives as the implementation of special catch and possession limits. The basic management assumption has been that in maintaining the highest quality fishery, the fish stock will be protected in some semblance to a pristine state, consequently ensuring that the public interest is also well protected.

In recent years, there have been several developments proposed and/or initiated which potentially will result in an expansion of the fishery. The Government of the Northwest Territories has initiated an outpost camp program which facilitates access for native groups to traditional fishing areas not used in recent years. There has been discussion of further expansion of the sport fishery. Finally, there have been requests to develop a commercial fishery on the lake and in the past year, there has been a limited test fishery to evaluate commercial potential.

Concurrent with the increased interest of potential users have been the concerns of the Department and the Government of the Northwest Territories about the future management of the fishery. These concerns indicate that a review of the resource management strategy for Great Bear Lake is opportune. In particular, there is a need to define management goals and objectives against which the potential benefits of various alternative uses can be assessed.

The problems faced by the Department in managing and allocating the fishery resources of Great Bear Lake are as follows:

1. The development potential of the fishery must be assessed with full consideration of the biological constraints in the fishery. The available information suggests that the biology of lake trout populations on Great Bear Lake could impose an important constraint on development potential. With respect to the other species, in particular whitefish, there is very little biological information so the potential is difficult to assess.

2. The fishery has been managed as a common property resource. The most prominent characteristic of a common property management system is that each potential user sees it to be in their private interest to obtain as large a share of the resource as possible. The pursuit of this interest, without regard to the potential economic impact on other users or the physical (biological) impact on the resource, can lead to the dissipation of the potential benefits of the fishery. In the extreme, it may also threaten the stability of the fishery resource.

   There is concern that the Great Bear Lake fishery is now entering a stage in the development process where the common property problem will become evident. This situation exists because there are areas of overlap in the competing interests for the right to use the resource. The Department must make decisions on allocation among these competing uses once the needs of the domestic fishery have been met.

3. The fishery resource should be allocated to that sector or sectors in which it will yield the highest economic and social contribution to the people of Canada. This is the conceptual goal which guides the Department in developing its allocation policies. Unfortunately, there are some problems in translating this concept into operational guidelines. This situation exists because the assessment of values in the fishery is difficult. It is further complicated by the fact that the biological, economic and social information which is required to evaluate diverse uses is not, to a large degree, readily available.

4. Public policies of the Department need to be co-ordinated with the policies of other federal agencies and the Government of the Northwest Territories. The relationship between fishery management and economic and social development is such that initiatives of any one agency can influence the conduct of programs of other agencies. This situation requires an understanding of the objectives of these agencies and their potential conflicts with the fishery management initiatives of the Department.

Purpose of Review

The purpose of this review is to examine the issues which have emerged in allocating the fishery resources of Great Bear Lake and to recommend a management plan which will enable the Department of Fisheries and Oceans to meet its objectives for fishery management. To the extent possible, the management plan will also be sufficiently flexible in order that the management objectives of other agencies can be accommodated.

The Great Bear Lake Working Group has been formed to inquire into and report on the management options in allocating the fishery resources of Great Bear Lake. This will be accomplished by:

1. Defining the objectives of the Department and those agencies likely to be affected by the resource allocation decisions of the Department, with respect to resource management and to economic and social development;

2. Defining and evaluating current and other choices of the use of the fishery through a review of existing information;

3. Recommending a long term management strategy in light of the evaluation of objectives and alternative uses;

4. Recommending an interim management strategy which will bridge information gaps and any other constraints which may exist but which will ensure that the long term management objectives are met. The interim policy will identify the information requirements for the continuing evaluation of the fishery, including the programs and analysis required for this purpose; and,

5. Evaluating the available policy instruments and legislation to meet the objectives of the Department for each use.

Methods of Review:

Representation

The working group includes representation from the Department of Fisheries and Oceans (three members), the Government of the Northwest Territories (two members), and the Department of Indian Affairs (one member).

Procedure

The working group shall meet, as required, to assemble the pertinent information for review. A document will be prepared which describes in detail the rationale for the conclusions and recommendations of the working group.

In the conduct of this review, the working group will circulate the Terms of Reference and arrange to meet with the existing users. The working group will request submissions from existing users on the matter of the future management of the fishery, in particular, the issue of allocating fish among competing uses. Should there be any difference in approach between the preferences of users and the position of the working group, these differences will be explicitly addressed in the working group's report.

Reporting Structure

The working group will report to the Director, Arctic Operations of the Department of Fisheries and Oceans and the Deputy Minister of Economic Development and Tourism, the Government of the Northwest Territories. The Deputy Minister, Department of Renewable Resources, the Government of the Northwest Territories and the Regional Director, Indian and Northern Affairs, will be advised of all deliberations of the working group.

Timing and Costs

The working group should aim to produce a final report no later than eighteen (18) months from the date of acceptance of the Terms of Reference.

The costs of meetings will be borne by each participating agency. The Department will be responsible for the production and distribution of the final report of the working group.

Appendix 2

Management Plan for the Great Bear Lake Fishery - Interim Report

April, 1984

Management Plan for the Great Bear Lake Fishery
- Interim Report -

by

Great Bear Lake Working Group

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EXECUTIVE SUMMARY

Great Bear Lake is entering yet another critical stage of development. Earlier decisions, taken in the interest of preserving high quality sport fishing, resulted in the curtailment of further lodge development (1965) and control of harvests by the implementation of strict catch and possession limits (1977). Recent proposals, if pursued, may affect the productivity of the fish resources of Great Bear Lake and, therefore, the potential economic and social benefits of the fishery.

The purpose of the review is to examine the issues in managing the fish resources of Great Bear Lake and to recommend a fishery management plan. This interim report presents interested parties with a perspective of the choices which must be made in planning for the future, in order that their views may be addressed in the management plan. A planning framework and criteria to evaluate alternative choices of use have been developed by reviewing the goals of those government agencies, both federal and territorial, whose resource management and economic development programs may influence the fishery. The information base and management issues in each of the existing and proposed fisheries have been evaluated.

AGENCY GOALS

The review of agency goals emphasizes the need to assess the benefits provided by the Great Bear Lake fishery from 3 perspectives; national, regional and community. These differences, while legitimate, are very important since they may influence the ranking of alternative choices of use. Hence, the need for agencies to cooperate in the development of their programs.

The Department of Fisheries and Oceans (the department) goal is that the fish resources of Great Bear Lake make their largest contribution to the economic and social welfare of Canada, subject to the requirement the resources be conserved. The department's concerns are that the fishery be economically efficient, that resource owners benefit from resource use and that the department be efficient in the conduct of its programs. In recognition of the economic and social significance of the fishery to natives, the department assigns the native domestic fishery the highest priority in use.

The goals of the Department of Economic Development and Tourism and the Department of Renewable Resources are, by and large, consistent with the goals of the department. There is a concern for the best use of the resources subject to resource conservation requirements and the highest priority of use is given the native domestic fishery. There is a substantive distinction between the national viewpoint of the department (all Canadians) and the regional viewpoint of the Government of the Northwest Territories (all residents of the Northwest Territories).

The Department of Indian and Northern Affairs, through its Indian and Inuit Affairs program, seeks to assist and support Indian and Inuit in achieving their cultural, social and economic needs and aspirations and to ensure that Canada's constitutional and statutory obligations and responsibilities to the Indian and Inuit peoples are fulfilled. Necessarily, the emphasis of this program is community oriented and, as a result, there is again a substantive difference with the viewpoint of other agencies.

FISHERY MANAGEMENT PRINCIPLES

The working group has reviewed some basic principles of fishery management, in order to move from the generalities of goal statements to the specifics of a fishery management plan. This review provides measurable, objective indicators which will be used in evaluating alternative choices of use.

The biology of fishery management deals with the development of sustainable harvest levels. Stocks must be delineated and their characteristics of recruitment, growth, and mortality determined. Estimates of the response of fish stocks to exploitation, as determined by yield models, enables the setting of sustainable quotas (annual allowable harvests). Hence, the concepts of maximum and optimum sustained yield. Optimum harvest size is determined from growth studies, providing information to control the size composition of harvests. Monitoring enables evaluation of whether actual response of the fish stock follows that which is originally predicted in the development of fishery regulation.

The economics of fishery management is concerned with the benefits and costs provided by a fishery and the effect of regulations on the performance of the fishing industries. The economic theory of a commercial fishery suggests the efficient level of fishing is where the difference between sustainable revenues from fishing and the total cost of fishing is at a maximum. This difference, the economic rent, is a measure of the value of the fish when used in the commercial fishery.

In the absence of regulation, the commercial fishery will expand to the point where total revenues equal total costs, the "open-access equilibrium", the result being that the value of the fish is dissipated in the expansion of fishing effort. Hence, regulation of a commercial fishery is necessary. Economic regulation of the commercial fishery can be achieved by affecting the price of outputs (landings tax), the price of inputs (effort tax), the quantity of outputs (individual quotas) or the quantity of inputs (effort shares).

The economics of the sport fishery requires an evaluation of the demand relationship between the price of access and the number of days an angler fishes. Fishing quality influences demand since if the quality of fishing improves, demand shifts outward and anglers are

willing to pay more for each day of fishing. As a result, the economic value is greater. Biology indicates the relationship between catch and effort, a critically important quality variable, and therefore provides an important consideration for the economic appraisal of the sport fishery.

The gross direct benefits of a sport fishery measure the economic value to anglers of their sport fishing activity. This benefit reflects anglers' maximum willingness to pay for the right to fish. There are two elements to the benefit, the amount anglers actually pay for the right of access in the form of licence fees plus the amount they would be willing to pay over and above what they actually pay (consumers surplus). The direct costs of the fishery include the public sector costs of fishery management. A sport fishery can provide net economic benefits in the form of consumer surplus and resource rent. If an appropriate price is charged, the rent can be collected by the licensing authority on behalf of the resource owners. Otherwise, the resource rent will be captured by anglers.

Both the commercial and sport fisheries provide an economic impact as a consequence of their operation. The direct economic impacts of the commercial fishery include the wages and salaries, profits and rents realized by fishermen and fish processors and their direct suppliers. The direct economic impacts of the lodge-access sport fishery include the wages and salaries, profits and rents realized by fishing lodges and their direct suppliers.

While economic impact analysis is of assistance in planning regional development programs, it is not used to evaluate the economic efficiency of resource allocation decisions because it does not take account of the alternative uses of the resources (opportunity costs) which combine to produce the economic impacts.

FISHERY MANAGEMENT ISSUES

DOMESTIC FISHERY

Resource use. Spot estimates of harvests suggest the domestic fishery has declined in recent years, perhaps the consequence of the more sedentary lifestyle of the Satudene and the decline in requirements for fish to feed dogs. The true extent of the change is not clear because the estimates have been made over time using undocumented methods which may be so varied as to render comparisons meaningless.

Management issues. The management issues in the domestic fishery are very straightforward, since all agencies assign the native domestic fishery the highest priority in use. There is a requirement to estimate the future needs of the domestic fishery, to provide sufficient fish resources to meet those needs and to develop a monitoring system to indicate how the needs are being met.

It will be necessary to decide whether current, informal arrangements of this fishery should be continued or whether it will be necessary to reserve an explicit allocation of fish resources by specifying the species, areas and quantities for domestic use. An explicit allocation would in effect be a domestic quota, analogous to a commercial quota. The purpose of a domestic quota would be to assess how much of the sustainable harvest is available for other uses.

Once a management plan is adopted, there will be a need to ensure close coordination with government programs which provide financial support to facilitate domestic fishing (principally the Special Arda program).

LODGE-ACCESS SPORT FISHERY

Resource use. The lodge-access sport fishery consists of 6 main lodges, 5 outpost camps distant from the main lodges and 2 outpost camps on the arctic coast. All lodges are presently active, with the exception of the Sah Tew lodge, Fort Franklin.

Annual licence sales by the sport fishing lodges on Great Bear Lake, excluding the vendor in Fort Franklin, indicate an average of 1 430 anglers purchased licences each year during the period 1973-82. Non-resident licence sales have represented 85% of total sales. Since there is not a one to one correspondence between licence sales and lodge guests, the actual number of guests is unknown but the working group has estimated there are approximately 1 300 lodge guests each year.

Fisheries and Oceans has conducted one complete creel census of lodge-access fishing, a 1972 study which estimated lake trout harvests of 46 897 kg. Subsequent studies have been done on a rotating basis, involving one lodge each season. Subsequent to the regulation changes in 1977 which reduced anglers' catch and possession limits, lake trout harvest levels at the two lodges studied declined to 42% and 50% of their 1972 levels.

The licence revenues for the Great Bear Lake lodges and the Fort Franklin vendor were $15 565 in 1982. The working group has estimated that Great Bear Lake fishing lodges earned approximately $2 500 000 in 1980 and, using industry averages, provided approximately $800 000 of wages and salaries, profits and rent (value added). Seasonal employment in the lodges averaged 225 for the period 1978-82.

Management issues. There is a need to decide what fishing quality the lodge-access sport fishery should be managed for. The basic choice is whether to manage for the maximum yield of larger fish or maximum sustainable yield, which would entail harvests of more, smaller fish. The existing angling effort is thought to be consistent with the maximization of lake trout harvests of 700 mm. A reduction in angling effort would result in harvests of fewer, larger fish; an expansion of effort would result in harvests of more, smaller fish. Thus, the choice of a management strategy for fishing quality will entail decisions of how many anglers, how much fishing effort and what har-

vests will be allowed in the lodge-access fishery.

The decisions on a strategy for fishing quality will resolve questions about further sport fish development potential in existing areas of use. Excluding the Keith Arm, there is virtually no area for further expansion. Within the Keith Arm, there will have to be consideration of the future operations of the Sah Tew Lodge and the sport fish potential offered by the new hotel development. Once the role for the sport fishery in the Keith Arm is defined, there will have to be decisions made on a strategy for fishing quality and related decisions on numbers of anglers, effort and sustainable harvests.

There is a requirement to assess whether the economic potential of the lodge-access fishery is being achieved. This will require a decision be made on what kinds of benefits the fishery will be managed for, the choice being to manage for direct economic benefits (resource revenues) or economic impacts (employment and regional income). If the fishery is to be managed for direct economic benefits, it will be necessary to consider alternative methods of regulation to achieve the economic goals for the fishery, including a change in the pricing of licences for Great Bear Lake, charging a tax on harvests of trophy fish (a royalty), or developing leases for fishing rights at a negotiated rental price. If the fishery is to be managed for economic impact, there is a requirement to consider how to effect a change in the regional incidence of employment and income benefits. This might be achieved by regulation of the purchasing and hiring patterns of lodges, or alternatively, by the use of financial incentives.

Thus, while there are a variety of regulatory systems which could be developed in order to achieve the goals for fishery management, the management issue is to select one of these regulatory mechanisms for the future management of the lodge-access sport fishery.

ITINERANT SPORT FISHERY

Presently, there is very little itinerent fishing activity so there is no management issue. There is a concern, however, that if Great Bear Lake is to be managed for sport fishing quality that there will have to be some form of control on total fishing effort from all sources.

The management issue which will arise should Great Bear Lake become more accessible to itinerant fishing activity is that any control of access will be at conflict with Canadian residents' opportunity of open-access to sport fishing opportunities throughout the Northwest Territories.

COMMERCIAL FISHERY

Resource use. The development of a commercial fishery is a priority project for the community of Fort Franklin. Presently, the fishery is limited to a test fishery in the Keith Arm.

The working group initiated a feasibility analysis in order to assess the potential for a commercial fishery. This analysis suggests a commercial fishery harvesting 13 608 kg of fish for fresh sale does not appear to be financially viable. This conclusion does not change when capital costs of fishing vessels and equipment are prorated to other uses. Additional volumes harvested for regional markets would improve the financial prospects, although the fishery would still not be financially viable. Additional fish harvested for fresh sales in southern NWT markets or for frozen sales through the FFMC would worsen financial performance. Under projected revenue and cost conditions, there is no economic rent potential for a commercial fishery.

Management issues. The biological issue arises from the limited information on the resource in the potential areas of development. There is a requirement to assess the fish stocks in the Keith Arm, Johnny Hoe and Whitefish Rivers.

The economic issue is how to allocate available resources to competing uses. This is a very problematic issue in light of the requirement to plan for the orderly development of sport fishing in the Keith Arm, the potential conflicts with existing sport fisheries in the proximity of the Johnny Hoe and Whitefish Rivers and the limited economic potential of the commercial fishery.

There is a requirement to assess the nature and extent of the physical and economic impacts of these fisheries on each other. Where there is no impact, it follows that surplus resources are available for use; otherwise, there will have to be decisions made on which use will take precedence.

Where fish resources are available, there will then need to be an assessment of the benefits which can be provided by a commercial fishery. If the financial and economic prospects appear positive, there will be an opportunity to increase the total economic benefits from the Great Bear Lake fishery. If the economic prospects are poor, the case for the development of a commercial fishery will hinge on whether or not social benefits exceed costs. This situation would require careful evaluation by those agencies concerned with economic and social development who would be faced with requests for financial support. As with the domestic fishery, once a management plan is developed, there will be a need to ensure close coordination of such economic and social programs with the resource management programs for Great Bear Lake.

MANAGEMENT OF RESOURCE USE CONFLICT

The allocation of resources to each use may be less than acceptable as conditions in the fishery change. There will have to be a mechanism established to resolve resource use conflicts between sectors, should they arise in the future.

Basic decisions will have to be made on whether the management of the fishery is best achieved by more centralized planning with consultation, such as resource use advisory boards, or whether a market for transferable fishing rights could be created. Alternative means of consultation on fishery management issues will have to be evaluated.

THE MANAGEMENT PLAN AND LAND CLAIM NEGOTIATIONS

The land claim negotiations may alter the ownership rights of either or both the surrounding land and fish resources of Great Bear Lake. In light of the uncertainties with these negotiations, there has been a reluctance to consider resource management issues in the area of land claims.

There should be general interest in seeing the fish resources of Great Bear Lake allocated to their highest valued uses, regardless of any changes in the assignment of property rights. If the resource owner(s) has the alternative of either using a resource or trading the rights to the resource, he will evaluate which course of action is more beneficial to him and act accordingly. In the process, resources will be put to their highest valued uses. Second, if there is an assignment of property rights, it follows that the resource owner(s) will ensure the distribution of benefits is in their favour. This is consistent with the departments stated purpose to ensure that the fish resources make their greatest contribution to economic and social welfare and to provide a direct benefit for the resource owner, currently all Canadians.

Therefore, there is an opportunity to develop a sound management plan for the future and to ensure this plan complements the land claims negotiation process.

INTRODUCTION

Purpose of review

The purpose of this review is to examine the issues in allocating the fish resources of Great Bear Lake and to recommend a fishery management plan which will meet the Department of Fisheries and Oceans' objectives. The management plan will be sufficiently flexible that objectives of other agencies may be accommodated.

The Great Bear Lake Working Group has been formed to inquire into and report on the management options in allocating the fish resources of Great Bear Lake. This will be accomplished by:

1. Defining the objectives of the department and those agencies likely to be affected by the resource allocation decisions of the department, with respect to resource management and to economic and social development;

2. Defining and evaluating current and other choices of the use of the fishery through a review of existing information;

3. Recommending a long term management strategy in light of the evaluation of objectives and alternative uses;

4. Recommending an interim management strategy which will bridge information gaps and any other constraints which may exist but which will ensure that the long term management objectives are met. The interim policy will identify the information requirements for the continuing evaluation of the fishery, including the programs and analysis required for this purpose; and,

5. Evaluating the available policy instruments and legislation to meet the objectives of the department for each use.

Statement of issue

The Department of Fisheries and Oceans is responsible for the management of the fish resources of the Northwest Territories on behalf of the owners of these resources, the people of Canada[1]. The department is concerned that the fish resources are conserved and that they make the greatest possible contribution to the economic and social welfare of Canada.

The existing management strategy accommodates domestic fishing and sport fishing use of Great Bear Lake. The department recognizes the importance of the fishery to native groups for a source of food and for their culture. Accordingly, the first priority of use is the native domestic fishery. The department has defined domestic fishing to mean fishing for food use but not for sale or barter.

The majority of anglers obtain access to Great Bear Lake through the five well developed sport fishing lodges. In addition, there is one lodge which is inactive. The department has managed the sport fishery as a trophy fishery of the highest quality. This has been achieved through such management initiatives as the implementation of special catch and possession limits. The basic management assumption has been that in maintaining the highest quality fishery, the fish stock will be protected in some semblance to a pristine state, consequently ensuring that the public interest is also well protected.

In recent years, there have been several developments proposed and/or initiated which potentially will result in an expansion of the fishery. The Government of the Northwest Territories has initiated an outpost camp program which facilitates access for native groups to traditional fishing areas not used in recent years. There has been discussion of further expansion of the sport fishery. Finally, there have been requests to develop a commercial fishery on the lake and in the past year, there has been a limited test fishery to evaluate commercial potential.

Concurrent with the increased interest of potential users have been the concerns of the department and the Government of the Northwest Territories about the future management of the fishery. These concerns indicate a review of the resource management strategy for Great Bear Lake is opportune. In particular, there is a need to define management goals and objectives against which the potential benefits of various alternative uses can be assessed.

The problems faced by the department in managing and allocating the fish resources of Great Bear Lake are as follows:

1. The development potential of the fishery must be assessed with full consideration of the biological constraints in the fishery. The available information suggests that the biology of lake trout populations on Great Bear Lake could impose an important constraint on development potential. With respect to the other species, in particular whitefish, there is very little biological information so the potential is difficult to assess.

2. The fishery has been managed as a common property resource. The most prominent characteristic of a common property management system is that each potential user sees it to be in their private interest to obtain as large a share of the resource as possible. The pursuit of private interests, without regard to the potential economic impact on other users or the physical (biological) impact on the resource, can lead to the dissipation of the potential benefits of

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[1] The land claim negotiations may alter the ownership rights of either or both the surrounding land and fish resources of Great Bear Lake. The implications of these changes for the development of a fishery management plan are outlined on pp. 22-23.

the fishery. In the extreme, it may also threaten the stability of the fish resource.

There is concern that the Great Bear Lake fishery is now entering a stage in the development process where the common property problem will become evident. This situation exists because there are areas of overlap in the competing interests for the right to use the resource. The department must make decisions on allocation among these competing uses once the needs of the domestic fishery have been met.

3. The fish resource should be allocated to that sector or sectors in which it will yield the highest economic and social contribution to the people of Canada. This is the conceptual goal which guides the department in developing its allocation policies. Unfortunately, there are some problems in translating this concept into operational guidelines. This situation exists because the assessment of values in the fishery is difficult. It is further complicated by the fact that the biological, economic and social information which is required to evaluate diverse uses is not, to a large degree, readily available.

4. Public policies of the department need to be coordinated with the policies of other federal agencies and the Government of the Northwest Territories. Because initiatives of any one agency can influence programs of other agencies, there is a need to work closely in developing a fishery management plan.

Methods of review

The working group included representation from the Department of Fisheries and Oceans (three members), the Government of the Northwest Territories (two members), and the Department of Indian and Northern Affairs (one member).

The working group reviewed available information on the domestic and sport fisheries. This review accepted the existing, albeit implicit, allocation of fish resources to each use and identified the management issues in each fishery.

The working group then considered the potential for expansion of the fishery above and beyond the existing levels of use. The management issues in planning for sport fishing developments which have already occurred in Fort Franklin were considered. A preliminary feasibility study of a whitefish commercial fishery was also conducted and the management issues identified.

The existing allocation of resources, accepted at the outset of the review, may prove to be less than acceptable as conditions in the fishery change. Accordingly, the working group identified alternative methods of resolving resource use conflicts between sectors, should they arise in the future.

Plan of study

This first section has described the purpose of the review and the methods used. The next section presents the goal statements for participating agencies and examines their interrelationships. A review of some biological and economic principles is next presented, in order to move from the generalities of the goal statements to more specific and operational indicators. These two sections provide a framework in which alternatives can be evaluated and ranked.

Next, the fishery management principles are applied to Great Bear Lake. After a brief description of the natural and human resources of Great Bear Lake, the existing and potential domestic, recreational and commercial fisheries are examined. The management issues in each fishery are identified. The choices in developing a means of resolving resource use conflict are then described. Finally, the relationships between the management plan and the land claims negotiations are outlined.

AGENCY GOALS

Department of Fisheries and Oceans

The Department of Fisheries and Oceans' goal for the management of the fish resources of the Northwest Territories, as stated in the Pacific and Freshwater Planning Overview (1982), is as follows:

"the primary objective of the federal government should be to exercise its constitutional powers to assure that national fisheries resources make their greatest possible contribution to the economic and social welfare of Canada. This is essentially an efficiency objective, concerning how the principal factors of production (fish, labour and capital) can be combined in such a manner that they produce the greatest possible benefits for a given cost."

This statement is important because it indicates the overall intent of the department's policies and programs for the Northwest Territories. Alternatives should be evaluated in a way which examines whether or not the contribution to economic and social welfare has improved or worsened.

The following statement of goals, as stated by the Commission on Pacific Fisheries Policy (1982), is consistent with the primary goal outlined above, yet provides an indication of the essential elements of policy for fishery management. The goal of fishery management should be:

1. to ensure that the fish resource is properly protected;

2. to ensure that fish resources available for harvesting make the greatest possible contribution to the economic and social development of the people of Canada;

3. to ensure the fishery provides an economic rent to the owners of the resource;

4. to ensure the management of the fishery is both systematic and efficient.

There has to be full consideration of the biological relationships in the fishery and their implications for resource use, hence the resource conservation objective. This takes precedence since without a sufficient resource base there is no potential to generate benefits from resource use. The second goal is the economic efficiency goal; the third addresses the distribution of benefits from resource use and indicates that resource use should provide returns for the owners of the resource. The fourth goal indicates the desire for efficiency in government.

National versus regional perspective. The goal statement indicates that the department is concerned with the fishery's contribution to the economic and social welfare of Canada. This is a national perspective, which the department has stated in the Pacific and Freshwater Planning Overview (1982) it has a responsibility to maintain when developing and implementing fishery management policies;

> "this perspective is extremely important when it is considered that DFO is a national body, managing national resources with national tax dollars. Thus, the management of fisheries in any region should result in benefits for all Canadians."

Efficiency versus equity. The department has indicated its primary objective is to ensure the fish resources of the Northwest Territories be managed to make their greatest possible contribution to the economic and social welfare of Canada. In principle, this means that economic rent should be derived from the fishery, since the economic rent reflects the difference between benefits and costs, including a normal return on capital invested in the fishery. Furthermore, since the rents reflect the value of the fish and the fish are owned by the people of Canada, it can be argued that the rents should accrue to the owners of the resource.

The department is aware economic efficiency may have to be compromised when one considers related, non-economic objectives such as employment creation, regional growth and social and cultural development. For example, a licensing policy which ensures preferential use by Northwest Territories residents is viewed as serving regional development objectives, the benefits of which must be balanced against economic efficiency losses.

The native domestic fishery is the most important example where non-economic objectives override the concern for economic efficiency. Even though the extent and values of the native domestic fishery are not well understood, the department has recognized the importance of this fishery by assigning it the first priority of use.

Economic rent potential. A fishery is economically efficient when the difference between total benefits and total costs is as large as possible. This difference is the economic rent, a measure of the economic value of the fish.

Very few fisheries in Canada actually provide an economic rent. In some areas, particularly the far north, resources are abundant and costs so high relative to demand and revenues, that there is no rent potential. Where the demand exceeds supply, fish resources have potential value. However, the way in which the fishery has been managed may have a profound effect on whether or not this potential is realized.

When the management of a fishery ignores the economic effects of regulation, the total costs of the fishery often will be larger than necessary. Because the benefits are the same, and costs have increased, the economic rent potential declines. One example of this situation is in the commercial fishery when harvesting costs rise as each vessel seeks to improve its fishing power in order to obtain a larger share of a fixed total harvest.

Alternatively, when the primary objective in managing a fishery is non-economic, economic rents may be foregone in the interest of achieving these other objectives. For example, a fishery developed for employment creation purposes would attract more labour and capital to harvesting operations than would be considered economically efficient. Because the costs are higher and the total benefits remain the same, the economic rent potential declines.

The economic rent potential in the fishery must be addressed, particularly when there are conflicts in use or among objectives. The economic rent potential indicates the economic value of the resource in each use, and the difference in resource values should be evaluated in deciding how to allocate the resource among competing uses. Furthermore, the economic rent foregone is a measure of the cost of serving non-economic goals of employment creation and regional development.

Department of Economic Development and Tourism

The policy of the Department of Economic Development and Tourism, Government of the Northwest Territories allows for the following:

1.(a) firstly for the utilization of the resource by the indigenous residents for domestic use, and,

(b) the remainder of the resource shall be utilized for the best socio-economic benefits of the residents of the N.W.T.

2. the uses in 1.(a) and (b) are subject to the following caveats:

(a) communities may waive their rights to domestic use for other resource activities;

(b) existing resource activities will be given the support of the department;

(c) the total use of the resource by all users shall not exceed the maximum sustained yield.

Department of Renewable Resources

The Department of Renewable Resources, the Government of the Northwest Territories has provided the following policy statement:

> The management plans of the Service should result from consideration of the many uses of wildlife as the needs for wildlife change.
>
> The best advice available must be used by wildlife managers, and they should be capable of applying techniques and programs in a manner consistent with proven and reliable principles of renewable resource management. Management plans must be based on sound wildlife management principles.
>
> Dependence on fish and wildlife for sustenance by a majority of residents is recognized by the Service. The Service, therefore, regards as high priority the co-operation with these residents in achieving optimum harvest of fish and wildlife resources. Total utilization of harvested fish and wildlife will be encouraged. The Service will be responsible for demonstrating humane and efficient harvest techniques, the best methods of preparing fish and wildlife products, and for encouraging and assisting residents of the Northwest Territories and non-residents to benefit from aesthetic values of wildlife.
>
> The optimum distribution of harvesters will be encouraged by supporting the establishment of camps in areas of economically harvestable populations of the species they seek, where such harvest is considered consistent with the principles of wildlife management.
>
> When financial assistance and incentive programs involve the use of fish or wildlife, the Service will ensure that advice is given to, and close co-operation is maintained with, the responsible Federal and Northwest Territories agencies.
>
> Where the aesthetic and recreational uses of fish and wildlife are important to residents and non-residents and to the economy of the Northwest Territories, and where such uses do not interfere with or jeopardize sustenance resource use, the Service will encourage these uses. The Service will attempt to maximize the participation of residents and increase the rewards to the Northwest Territories of such ventures. In such areas, wildlife will be managed to provide maximum recreational opportunity and aesthetic appeal.
>
> Carnivores are a valuable part of the ecosystem and the Service believes that conflict with carnivores should be avoided by humans where practical. In situations where removal of specific carnivores seems necessary in response to a particular problem, control will be implemented only after investigation by the Service has confirmed that a need exists. Highly selective means of control are preferred. The use of bounties is not acknowledged as an effective control method.
>
> The reservation of areas for management studies will be encouraged by the Service. Co-operation is pledged to other agencies or individuals whose research is designed to produce useful information on wildlife species. Consultation between these researchers and the Service will be maintained. The provision of reports on research results will be required.
>
> The capturing, holding, export, and import of wildlife species for the purpose of stocking, public education, or scientific study may be permitted if suitable habitat or holding facilities are available. A capability must be demonstrated by the applicant to capture and hold wildlife in a humane manner. Substantial benefits must accrue to the people of the Northwest Territories, to the nation, and to other nations involved with the preservation of the species concerned.
>
> Transplanting wildlife species for restocking former ranges may be desirable if sufficient and suitable habitat to support a viable population is available, and if the introduction of the transplanted species will not adversely affect the resident species. The transplanting of exotic species will be discouraged because such ventures often have unforeseen detrimental effects.

Department of Indian and Northern Affairs

The following policy statement has been provided by the Department of Indian and Northern Affairs.

> The principal objective of the Indian and Inuit Affairs Program, Department of Indian and Northern Affairs is to assist and support Indian and Inuit in achieving their culture, social and economic needs and aspirations, and to ensure that Canada's constitutional and statutory obligations and responsibilities to the Indian and Inuit peoples are fulfilled. This objective is in keeping with the principles of self-determination, access of opportunity, responsibility and joint participation within Canadian society.

Interrelationships of Agency Goals

The department's concern is that the fishery make its greatest contribution to the economic and social welfare of Canada, subject to the resource conservation objective. The department's interest in seeing that the fishery be operated efficiently, that resource owners benefit from resource use and that government be efficient in the conduct of it's programs were also outlined. In practice, the department has assigned the native domestic fishery the highest priority in use.

Economic Development and Tourism's goals are, by and large, consistent with those of the

department. They also reflect a concern for resource conservation and provide highest priority to the native domestic fishery. One substantive difference is that Economic Development and Tourism's policy provides for the benefit of residents of the N.W.T., whereas the department has a national perspective. This distinction is both appropriate and important. It is appropriate because the overall goal for the Government of the Northwest Territories is to maximize the well being of residents of the N.W.T. It is important because benefits and costs of the fishery which accrue to other than territorial residents do not matter from the territorial perspective. Thus, for example, costs of management borne by all Canadian citizens do not enter the benefit-cost calculations of the Government of the Northwest Territories. However, they are an obvious concern to the department.

The Department of Renewable Resources recognizes the importance of domestic fishing and hunting, supports the aesthetic and recreational uses of the fish and wildlife where such uses do not interfere with or jeopardize sustenance resource use, and attempts to maximize the participation of residents and increase the rewards to the Northwest Territories of aesthetic and recreational use. Again, there is much in common between the goal statements of the department and Renewable Resources. The distinction between the national and territorial perspective exists, as noted above. Renewable Resources has stated that employment in resource development ventures by territorial residents is a priority. The department has not indicated employment creation as a goal; rather, there is an overall interest in seeing the fishery operate as efficiently as possible (labor and capital inputs should be minimized rather than maximized).

The Department of Indian and Northern Affairs has a mandate to assist and support the cultural, social and economic needs of the Indian and Inuit. The emphasis of this program is community oriented, to be contrasted with the national perspective of the department and the territorial views of agencies of GNWT. Again, this distinction is both legitimate and important.

The review of agency goal statements emphasizes the need to assess the fishery management plan from three viewpoints: national, territorial and community. In order to assess whether or not the goals of all agencies are met, it is important to consider both the magnitude and the distribution of the benefits and costs of the fishery.

FISHERY MANAGEMENT PRINCIPLES

A problem with the goal statements outlined above is that certain of the concepts are sufficiently vague they can mean many things to many people. For example, the resource conservation objective suggests a basic requirement is that the resource not be exploited to extinction. However, the resource conservation objective does not indicate which of rival management strategies which satisfy this criterion should be preferred. For example, is it preferable to reduce effort and maximize the yield of larger fish or expand effort and achieve larger sustainable yields consisting of more, smaller fish? Since either management strategy would be consistent with the resource conservation goal, there is a need to proceed from the general to the specific.

There is similar, if not greater, ambiguity with the idea of "economic and social welfare". Many alternatives contribute to economic and social welfare. Naturally, each resource user group views their contribution to the well being of the nation as paramount. It is not uncommon to see comparisons of gross expenditures of anglers with gross earnings of commercial fishermen, with reference to the significantly higher benefits to society per pound of recreational fish harvested. Similar arguments may be put forward with respect to the employment impacts of each, the role of 'traditional' lifestyles, and so forth. While these arguments may be intuitively appealing, they are inappropriate and misleading in the evaluation of the economic and social contribution of the fishery to society. Consistent and comparable indicators must be used when alternative resource uses are evaluated.

In the interest of clarifying principles central to the development of operational goals for Great Bear Lake, a brief outline of biological and economic principles is provided.

BIOLOGICAL PRINCIPLES

Fishery management is the discipline that deals with understanding the response of fish stocks to exploitation and recommending rates of exploitation that will ensure the resource will be sustained. It involves the study of population dynamics including estimated growth, birth, death rates, feeding habits, environmental conditions and abundance of fish stock. From this information it is possible to determine how fishing affects the population and to control fish harvest by manipulating the population levels and harvest rate.

The basic functional unit in fishery management is the stock. A stock is commonly defined as an aggregation of fish in which the adult fish annually return to the same spawning ground and have similar characteristics of recruitment, growth, mortality and geographical distribution. It is important to note that the fisheries concept of a stock is different from the biological concept of a population. A population is the breeding unit of a species. A stock may be a portion of a population, or it may include more than one population.

The first step towards effective fishery management is to delineate the stock. Tagging or marking studies are often employed to determine its geographic distribution. Examination of catch statistics provides information on size and age structure as well as growth, recruitment and mortality rates. Catch and effort statistics are useful in determining relative abundance. Also of assistance in delineating the

stock are morphological (study of form and structure) and physiological (study of function and vital processes) analyses of fish populations.

Stocks are influenced by both density-dependent and density-independent factors. Density-independent factors include weather and hydrological characteristics such as water temperature, salinity, currents, etc. Density-dependent factors are those which are influenced by the number of individuals in the stock and have an effect on such characteristics as growth.

A virgin stock is one which has never been fished and is in balance, or equilibrium, with its environment. The stock is in equilibrium because growth of individual fish and additions through reproduction (recruitment) equals the loss of fish which die from natural causes (natural mortality) (Figure 1).

Total net growth rate of a virgin stock is zero because the weight of fish which die from natural causes equals the weight of fish being hatched and growth in the stock.

Fishing upsets this balance since it increases the rate at which individuals are removed from the population (fishing mortality). However, with the decrease in stock size by fishing, there are fewer fish and thus less competition for the same food. The individual fish grow faster and fewer fish die from natural causes.

As long as fishing is not too intense, the weight loss to the stock through fishing can be replaced through the increased growth. This results in an increase in the net growth rate of the stock. Fishing can be carried out on a sustained basis, however, there is a maximum sustained yield or MSY. If fishing intensity exceeds that which provides the MSY, increased rate of growth cannot compensate for the loss of individuals through fishing and the net growth rate begins to decrease. It will eventually diminish to zero when the stock size approaches extinction. This concept is illustrated in Figure 2.

If a small amount of fishing takes place, such as in situation A, the number of fish in the stock is reduced, but this loss is compensated for by increased growth of the remaining individuals. If more fish are harvested, as in situation B, the stock is still able to compensate for the loss. The maximum harvest that can be taken where the stock can be harvested is the MSY. If the harvest is increased beyond the MSY, such as in situation C, the removal of fish exceeds the stock's ability to compensate for the loss through growth and the stock biomass becomes over-exploited.

The MSY leaves no room for error and often is not economical to the industry. As fishing begins the total catch will be high since the stock is only being lightly exploited and as fishing mortality increases fewer fish remain. It becomes harder to catch the remaining fish and effort, which is costly, must be increased (Figure 3). This cost must be balanced against the value of the catch. Therefore, the optimum sustainable yield or OSY is determined. Yield or catch is less than the MSY but offers a better return for effort.

Understanding growth is of critical importance to effective fishery management. Rate of growth varies during a fish's life. Initially it may be slow, then speeds up, and then it may slow down as the fish get older (Figure 4).

The effect that an increase in growth of the individual fish has on its year class must be considered. Year class means all of those fish that were born to that stock during a given year. As time goes on, the number of individuals in that year class diminishes due to loss by natural and fishing mortality (Figure 5).

However, as individuals get older, their growth rate increases. When this individual growth is considered collectively it results in a peak total weight for the year class. Even though there are fewer individuals remaining in the year class, due to mortality, compared with the initial numbers, each individual weighs more than it did when it was smaller. The net result is a many-fold increase in weight despite the loss of a large percentage of individuals. The total weight increase will eventually reach a maximum. The increase stops when the weight lost by the year class due to natural mortality equals weight gained by growth of the surviving fish. Therefore, there is an optimum size (age) at which the fish should be harvested if this peak growth is to be utilized. If fish are harvested at a smaller size, this growth will not have taken place. As well, if overfishing of young, smaller, fish takes place before they reach sexual maturity, it will lead to a reduction in the number of fish comprising the spawning stock. This in turn will lead to a reduction in stock size. If fish are harvested at a larger size, the peak will have declined and will not be available to the fishery. Fishery managers determine the optimum harvestable size by studying the growth characteristics of the stock and setting minimum mesh sizes or minimum fish size limits.

In summary, fishery management deals with the development of sustainable harvest levels on fish stocks. Stocks must be delineated and their characteristics of recruitment, growth and mortality determined. These data are applied to yield models. The yield models attempt to determine mathematically the response of the stock to varying levels of exploitation. If population models accurately describe the response of stocks to various levels of exploitation, they enable the fishery manager to establish a quota or total allowable catch (TAC) which the stock can sustain. If economic factors are taken into consideration, the optimum sustainable yield is estimated and is designated as a quota or TAC. Optimum harvest size is determined on the basis of growth studies and regulations governing minimum gear size or catch size are formulated. Monitoring programs which periodically sample the catch (or stock) and record effort are implemented to determine whether the stock's actual response follows that of the predicted response.

Economic Principles

The following outline illustrates objective economic criteria used to measure economic and social welfare. These criteria have relevance for the development of the Great Bear Lake fishery management plan, since they are consistent and comparable measures of economic value. They will be used in ranking alternative uses.

COMMERCIAL FISHING

Economic values. H. Scott Gordon (1953) presented one of the earlier works on the economics of commercial fisheries. The biological relationship between catch and fishing effort indicates that as fishing effort increases, landings increase but at a decreasing rate (Figure 6). A maximum catch will be reached, the maximum sustainable yield, after which there will be a decline in landings even though there is additional fishing effort.

The market price of fish represents the value that individuals place on fish, so the total revenue measures the gross value to society of fish produced. The total revenue curve describes the relationship between total revenues and fishing effort. Under certain assumptions (a constant price for all volumes), the total revenue curve has the same shape as the catch and effort curve.

The total costs include both industry costs of harvesting and public sector costs of management. The costs measure the value of the resources used, value determined by the goods and services foregone elsewhere in order to harvest and manage fish. The total cost curve measures the relationship between costs and effort. In its simplest form, the industry cost curve indicates that extra effort can be applied at a constant additional cost. The management cost curve also indicates increased costs are associated with an expansion of the fishery (Figure 6).

Economic theory suggests if entry to the fishery is not regulated, then the fishery will expand until industry revenues equal industry costs (E_1 in the diagram). At any level of effort less than E_1, total revenue will be greater than total cost. Average revenue per boat is greater than average cost per boat, so any one individual will find it profitable to enter the fishery. Beyond the level of effort Emsy, private revenues are greater than costs, even though total revenue for the fishery as a whole is declining. Beyond E_1, total revenue will be less than total cost and fishermen will leave the fishery. The point where industry revenues equal industry costs is the open-access equilibrium.

The economic optimum occurs where the difference between sustainable revenues from fishing and the total cost of the fishery is at a maximum (E_2 in the diagram). This is the economically efficient level of effort. To the left of this level of effort, the value to society of additional fish is greater than the services foregone; to the right of this level of effort, the value to society of additional fish is less than the cost incurred. Clearly, the open-access equilibrium is not an economic optimum.

The economic optimum is the level of effort where the maximum sustainable economic rent is obtained. Economic rent is the surplus of revenue received over and above what is needed to pay all costs, including a normal return on the capital invested in fishing operations and the public sector costs of management. It is the value of the fish when used in the commercial fishery. The existence of economic rent is the single most important indicator of the economic performance and value of the fishery.

Regulation of the commercial fishery is necessary because of the undesirable results when there is uncontrolled access to the fishery. Traditional regulatory measures, such as quotas, open and close seasons, and gear restrictions will satisfy the biological objectives of management. However, they lead to an increase in the cost of harvesting fish, thus largely eliminating the potential economic benefits of regulation. The economic regulation of the fishery can be achieved by affecting the price of the output or the inputs or by regulating the quantity of outputs or inputs (Clark 1979). The price alternatives include a landings tax (output) or an effort tax (input). The quantity alternatives include individual quotas (output) or effort shares (input).

Pursuit of any one of these alternatives is called a limited entry program because their aim is to reduce the total inputs in the fishery without directly affecting the efficiency of individual units. With the exception of the landings or effort tax, they may also be called exclusive rights management schemes because the restriction on the amount of inputs is obtained by granting property rights or quasi-property rights in the fishery.

Economic Impacts. There are also a number of secondary impacts which arise from the operation of a commercial fishery. The sale of fish involves an inflow of funds to the commercial fishing sector. In turn, fishermen use revenues in subsequent transactions to buy fuel, bait, nets, twine and food in their transactions with grocery stores, merchants and banks. The stores, merchants and banks generate further transactions, stimulating economic activity in other sectors of the economy.

The direct economic impacts of the commercial fishery include the wages and salaries, profits and rents generated in the fishery and the wages and salaries, profits and rents which accrue to the direct suppliers of the fishing sector. At an earlier stage of production, there is an indirect economic impact which occurs in those industrial sectors providing goods and services to the suppliers of the fishing sector.

Economic impact analysis is of particular use in looking at the so called "secondary" benefits of the fishery. However, as the viewpoint changes from regional to national, the alternative uses of the resources which combine to produce the economic impact increase. These alternatives (opportunity costs) must be matched

with the benefits created (Millward 1971). Conventionally, from a national perspective, economic impact benefits are equated with costs and there is no net economic yield to the economy.

SPORT FISHING

Economic values. Anderson (1980a; 1980b) develops a useful model of sport fishing. The demand for a sport fishery measures the relationship between the price of fishing and the number of days an angler will fish, all other factors constant. It is an inverse relationship, with higher prices resulting in lower quantities demanded, other factors constant. Among the factors which influence demand are changes in individual tastes, incomes, the price of complementary and substitute goods, and the "quality" of the fishery. Several attributes may together form the "quality" of a fishery, including such fish attributes as the daily gamefish catch rates or the size of individual fish caught. There is a direct relationship between the quality of the fishery and economic demand and value. If the quality of fishing improves, demand shifts outward since anglers are willing to pay more for each day of fishing. The value of the fishery increases as a result. Conversely, if the quality declines demand shifts inwards, anglers are less willing to pay for each day, and the value declines (Figure 7).

The biology of the fishery indicates what quality of fishing is consistent with any level of effort, since there is an analogous relationship between catch and angling effort as was defined for the commercial fishery. Total sustainable yield increases with increased angling effort until a maximum sustainable yield is reached, but declines as angling effort increases beyond that point. The average sustainable yield, which measures the average catch per angler day, varies inversely with effort. The greater the effort, the lower the catch per angler day.

An economic model of the sport fishery which incorporates both biological and economic relationships illustrates the need to consider the effect of fishing effort on quality and hence on demand and value. For any fishing site, there is a "family" of demand curves, with the position of each curve depending on the overall quality, higher curves associated with higher quality. Each curve assumes the quality of fishing to be constant, so they are called a family of constant quality demand curves. However, because of the biological relationships in the fishery, which indicate one level of quality is consistent with given effort, only one point on each of these curves is possible. The line joining these points is called the operational market demand curve (Figure 8).

The economic model can be used to examine the economic values in the fishery. The appropriate measure of value is the area under the constant quality demand curve which corresponds to the effort and quality actually observed in the fishery. There are two elements of value. First, there is what anglers actually pay for the right to fish in the form of licence fees. Second, there is the consumer surplus, the amount an individual would be willing to pay for the right to fish over and above what is actually paid. In Figure 9, the licence revenues are equal to the area (OP_1AD_1) and the consumer surplus is equal to the area (P_1P_2A).

In the measurement of the net value to society of the sport fishery, it is also necessary to account for the management costs in the fishery. The net economic value is the difference between the total area under the constant quality demand curve and the costs of management. In Figure 9, the net economic value of P_1P_2AB equals the difference between total value OP_2AD_1 and total costs of $OP'BD_1$. The net value is greater than the consumer surplus when the price P_1 is charged by the amount $P'P_1AB$. This amount is the resource rent, the surplus which is attributable to the fact that nature provides mankind with the fish free of charge, enabling the owners of the resource to provide fishing opportunities at a cost far below its value to the anglers (Department of Fisheries and Oceans, 1983).

If an appropriate price is charged for fishing the rent can be collected by the licensing authority on behalf of the resource owners. Otherwise, the rent can be captured by the anglers. A similar comment can be made with respect to management costs. If prices are artificially low, not only will the angler capture the resource rent but the costs of managing the fishery will be subsidized by the general taxpayer who has funded the costs of resource management.

The economic value of Canadian resident angling equals the total value less the management costs. The economic value of non-resident fishing activity equals what non-resident anglers actually pay for the right of access to the fishery in the form of licence revenues less the management costs.

Economic Impacts. The economic impacts of the sport fishery arise as a consequence of the expenditures of anglers in pursuit of recreation activity. The direct economic impact includes the wages and salaries, profits and rents realized by lodges and the direct suppliers of lodges as a consequence of their sales to the lodge industry. There is also an indirect economic impact which arises as a result of the purchases by all industries in which production is required to provide goods and services to the direct suppliers of lodges.

The limitations of economic impact analysis as a criterion for resource allocation decisions was described in the discussion of economic impacts of the commercial fishery.

NATURAL AND HUMAN RESOURCES OF GREAT BEAR LAKE

The lake

Great Bear Lake, the fourth largest lake in North America, is situated between latitudes 64°40'67° north and longitudes 118° and 125°west (Figure 10). It lies 60 miles east of the Mac-

kenzie River with the Arctic Circle intersecting its northernmost arm. The total area of the lake is 31 293 km^2 of which 30 697 km^2 are water (Falk et al. 1973). Great Bear Lake consists of 5 arms radiating from a large central area, named McTavish, Smith, McVicar, Dease and Keith Arms.

The eastern end of McTavish Arm lies within the Precambrian Shield, while the remainder of the arms are in the Mackenzie Lowlands. An outcrop of Shield formation is found in Dease Arm, forming the Narakay Islands, which rise sheer from the water to a height of several hundred feet (Falk et al. 1973). The shoreline tends to be fairly flat, relieved only by Grizzly Bear Mountain between Keith and McVicar Arms, the Scented Grass Hills between Smith Arm and Deerpass Bay and Kokeragi Point on the south side of Deerpass Bay (Johnson 1966).

The drainage basin of Great Bear Lake has an area of 145 870 $km.^2$ which is about 5 times the surface area of the lake itself. Johnson (1975a) observed that this relatively small basin combined with the low precipitation precludes the development of a major river system; the majority of the water enters the lake by way of small streams, many of which have significant flow only during the period of snow-melt. The two main rivers supplying the lake are the Camsell and the Johnny Hoe; together they drain 30% of the total basin (Anon. 1970, 1972) and contribute about 20% of the total outflow.

The Camsell River, which enters Conjuror Bay in McTavish Arm, is the larger of the two, delivering less than 1/5 of the annual outflow through the Great Bear River. The Johnny Hoe River, which enters McVicar Arm, delivers about 1/27 of the annual outflow. The only other rivers that drain appreciable land areas are the Dease and Whitefish Rivers. The Whitefish River drains the region between the Keith and Smith Arms, emptying into the western end of Smith Arm.

The climate

The Arctic Circle transects the northernmost arm of the lake, so the sun is visible from it for 24 hours a day in June, while in midwinter daylight lasts for only two to three hours (Johnson 1975b). In July, the mean daily maximum temperature is 19°C., in sharp contrast to the equivalent January temperature of -27°C. Warm summers and cold winters, together wih a total annual precipitation of about 230 millimetres, give rise to conditions which may best be described as northern continental.

Continuous snow cover on the surrounding land usually lasts for about 220 days, from the beginning of October to the end of May, although heavy falls may be experienced both before and after these dates. Although freezing in the sheltered bays may start in September when air temperatures fall below 0°C, the main basin is not completely frozen until December. Ice formation continues until April when it may reach a thickness of 2.6 m inshore with a mean of about 1.5 m over the offshore regions. At this time of year the snow cover seldom exceeds a thickness of 20 cm; it is not uniform and patches of clear, bare ice alternate with areas of well compacted snow. The ice begins to melt in May and by mid-June there is open water in the bays, but it is not until July that ice clears from the main lake.

The Satudene

Satudene, a term derived from the Slavey words meaning "bear-water-people", is the name given the native people who traditionally inhabited all the country around Great Bear Lake. The Satudene are a tribe distinct from the four tribes well known in the history of northern Canada, Dogribs, Yellowknives, Hares and Slaves. The Great Bear Lake region does not coincide with the areal extent of any of these four tribes but is, rather, the extent of the distribution and environmental utilization of a hybrid group which emerged from these main tribes after they had been pushed towards Great Bear Lake during the late eighteenth century (Morris 1972).

The Satudene were for many years a nomadic tribe, the specific location of the people changing somewhat from year to year according to the hunting patterns. While the Fort Franklin settlement dates back to the early 19th century when Sir John Franklin established a winter headquarters on the north shore of Keith Arm, about 10 km. from the head of the Great Bear River during his expeditions to explore and map the south shore of the "Polar", Beaufort Sea, the Satudene continued to live in their bush camps, coming into the Fort Franklin trading post only a few times a year, to celebrate religious holidays and to trade their furs (Resource Management Consultants 1982).

A Roman Catholic mission and federal day school were established in Fort Franklin in 1949-1950. Government health care and social assistance came next, and thereafter housing was made available at trading post sites throughout the Mackenzie Valley. These amenities gradually attracted the Satudene from their bush camps to established permanent residence at the Fort Franklin site, and by the mid-1960s the process was virtually complete, all of the residents of the area having acquired residence in town.

Population and labour force

The recency of permanent settlement of this village has meant that it has grown relatively rapidly as people gradually moved into the town from the land. As a result, the population increased from 238 in 1961, to 333 in 1971, to 422 in 1976. The 1980 population was 545. This rapid rate of increase is now expected to level off, as seen by the fact that the projected population for 1988 is about 600 people (Resource Management Consultants 1982).

Fort Franklin is an overwhelmingly Dene community: 92 percent are treaty Indian, 2 percent are Metis, and only 6 percent are non-native. It is also a young community in terms of the age distribution of the population. Forty percent are under 15 years of age, 45 percent are 15 to 49 years, and only 15 percent are fifty and over, including just 5 percent past retirement age.

The labour force, the component aged 15 to 64 years, is estimated at 280 people, 55 percent of the total population. The youthfulness of this group is seen in the fact that half are under 30 years of age. The total participating labour force includes 69 percent of the potential force, and men outnumber women about three to two.

The local economy

Generally, the local economy of Fort Franklin is similar to that found in most of the small, isolated, and overwhelmingly native settlements in the taiga of Northern Canada (Resource Management Consultants 1982). The most important activities are hunting, fishing and trapping. There is a local cooperative business which produces and markets local handicrafts and runs a lodge which accommodates sports fishermen, in addition to a small general store (The Bay). A very modest amount of local wage employment is available, primarily in connection with provision of local services.

The most important economic activities in Fort Franklin are hunting and fishing. In evidence given before Mr. Justice Berger the (then) Indian Brotherhood of the Northwest Territories reported, that based on the "Land Use and Occupancy Study", the dollar value of land-based activity to the people of Fort Franklin in 1974-1975 was estimated to be between $225,000 - $250,000. An associated, and very important economic activity is trapping. The number of trappers active in Fort Franklin in 1978, 1979 and 1980 were 72, 61, and 84 respectively. Their gross earnings in each of these three years were $84 650, $159 986 and $155 687. The average earnings per trapper were rather modest, however, amounting to $1 176 in the first year, $2 623 in the second, and $1 854 in the third year. In fact, in every one of these years at least one third of the trappers earned less than $600 from trapping, and in every case less than 20 percent earned more than $4 000.

DOMESTIC FISHING

Resource use

Johnson (1975b) observed the dependence of the Satudene on the caribou as a principal source of food obliged the Satudene to a migratory lifestyle, and accordingly, the domestic fishery followed a pattern where camps were established where both good fishing and caribou hunting were possible. The favoured locations were the head of Great Bear River, the fishing grounds of Hornby Bay, Cloud Bay, Deerpass Bay, and, particularly, the southern part of McVicar Arm (Johnny Hoe River); as well, the region drained by the Whitefish River between Keith and Smith Arms.

The preferred species, according to Morris (1972) is whitefish, which is found in the sandy bays and is particularly abundant in the fall at the southern end of McVicar Arm (Johnson 1975c). Walleye is confined to the region at the mouth of the Johnny Hoe River (Johnson 1975c), while lake herring are particularly abundant in the spring and represent a dietary mainstay.

Miller (1947) estimated the domestic fishery harvest to be nearly one million kg of whitefish, cisco and trout (Table 1). Subsequent estimates suggest the significance of the domestic fishery has declined. G. Abrahamson (1964) reported a harvest of whitefish in McGill Bay in the fall and early winter of 117 255 kg. Cuttman (1973) estimated the total harvest in 1973 to be 49 442 kg (Table 2). He was of the opinion that prior to 1973 the domestic harvest could have been as high as 136 079 kg annually; however, due to a decrease in the number of dogs in Fort Franklin, the figure has been diminishing. Cuttman estimated the harvest to be 18% lake herring, 27% grayling and lake trout, and 55% whitefish. Rushforth (1975) estimated the domestic harvest from June, 1974 to May, 1975 to be in the order of 48 063 - 67 441 kg (Table 3).

The most recent estimate of the domestic harvest referred to only a part of the fishery. Hall (1977) estimated that 1 270 kg were harvested in Deerpass Bay in the spring and 13 608 kg were harvested from Bydand Bay in the fall and early winter.

The operation of the domestic fishery has been influenced by a joint federal-GNWT program, referred to as Special Arda, developed to provide financial assistance to the Indian and Inuit of the Northwest Territories. The Special Arda program provided funds for six projects pertinent to Great Bear Lake between 1978-1983. Four of these related to the outpost camp program, which provides financial assistance and services to any family or group of persons, less than 60 in number, who hold general hunting licences, and who are living away from settlements or wish to move from settlements to isolated locations in the Northwest Territories for at least three months of a year to make a living off the land. Included in these projects were assistance to develop cabins at McVicar Arm, Hottah Lake, White Losh Lake and Caribou Point in 1978 and funds to renovate 5 cabins at the Johnny Hoe River in 1979.

Management issues

All agencies assign the native domestic fishery the highest priority in use and, as a result, the management issues are very straightforward. There is a requirement to estimate the future needs of the domestic fishery, to provide sufficient fish resources to meet those needs, and to develop an information base which will indicate how those needs are being met. There is also a need to ensure that government programs which influence the domestic fishery are coordinated with the overall management programs for the fishery.

Estimating future needs. While spot estimates suggest the domestic fishery has declined over the years, the true extent of the change is not clear. The estimates have been made over time using undocumented methods which may be so varied as to render comparisons meaningless.

The working group feels there should be an estimate prepared of the extent of future domestic fishing on Great Bear Lake. This would reduce the problem which arises with the current information base. Necessarily, this estimate will have to be prepared in cooperation with the community of Fort Franklin. The estimate of future needs should document the current number of participants, areas used, timing and duration of the fishery, and species fished and volumes harvested. There should also be consideration of the trends in the fishery and the factors which are thought to be influencing these trends.

Providing for the domestic fishery. The evaluation of future needs will be an important first step in the development of a management plan for Great Bear Lake. Equally important will be decisions on how best to provide for those needs. Currently, the domestic fishery operates very informally. There are no restrictions on areas, species, volumes or seasons. In planning for the future, it will be necessary to decide whether the current arrangements should continue or whether it will be necessary to reserve an explicit allocation of fish for the domestic fishery, through the definition of areas, species and quantities available for domestic use, somewhat analogous to a commercial quota.

Monitoring domestic fishing. Reliable and cost effective information on the extent of the domestic fishery will be required for the future management of the fishery. The management issue is how best to monitor domestic fishing activity.

Coordination of government programs. The extent of the domestic fishery has been influenced by the outpost camp program, the special ARDA project designed to facilitate access to isolated locations to make a living off the land. The management issue is the need to ensure that government programs which influence the domestic fishery are coordinated with the management plans for the fishery.

THE LODGE-ACCESS SPORT FISHERY

Resource use

Lodge Development. The sport fishery on Great Bear Lake is a lodge-access fishery, with virtually all anglers arranging access through the sport fishing lodges situated on the lake.

The present lodge industry consists of 6 lodges, with 5 outpost camps located in more remote parts of the lake (Figure 11). In addition, two lodges offer side trips to outpost camps on the arctic coast for charr fishing. All are presently active with the exception of the Sah Tew lodge in the community of Fort Franklin.

The five active lodges have a total bed capacity of 222 beds, the facilities ranging in bed capacity from 34-54 beds (Table 4). The ownership and location of the outpost camps is summarized in Table 5.

Lodge development began in the 1950s, with the majority of activity taking place in the following decade. Great Bear Lodge, located on the southwestern portion of McTavish Arm at Sawmill Bay, claims to be the first lodge on the lake. While the present lodge was established in the mid-1960s, during the second World War this camp was used as a stopover for transcontinental flights. The lodge operation continues to use the runway facilities at Sawmill Bay, but presently uses two camps to accommodate their guests, one an island on Neiland Bay, and the other a lodge on Bear Island. The operation on Bear Island has variously been called the Explorer's Club, or Great Bear Lodge Annex. In addition to trout fishing in McVicar Arm, the lodge offers grayling fishing at Blackwater Lake and the mouth of the Great Bear River on a fly-in basis from the outposts.

Great Bear Lake Lodge (Plummer's) was first developed in Conjuror Bay in 1961. Subsequently, the operation was moved in 1969 to its present location in Dease Arm and the lease for Conjuror Bay was surrendered in 1974. Great Bear Lake Lodge, the largest lodge on the lake, is accessible by a private airstrip located a short distance from the lodge. The lodge offers jet service from Winnipeg, as well as side trips to the Tree River outpost camp for arctic charr fishing.

Branson's Lodge is located in the central portion of McTavish Arm, a short distance east of Port Radium. This lodge started operations in the mid-60s at the old town of Cameron Bay. In addition to the main camp, Branson's Lodge operates an outpost on the north shore of Smith Arm at the Katseyedie River and offers a side trip to the Coppermine River at the Arctic Coast for arctic charr fishing. Branson's Lodge does not have runway facilities at the lodge, and as a result uses the airstrip at Sawmill Bay, approximately forty miles south of the lodge. The lodge is served by chartered Hawker Siddley from Edmonton to Sawmill Bay. Guests are then transported by float plane from Sawmill Bay to the lodge.

Arctic Circle Lodge, situated on the north shore of McTavish Arm, lies approximately twenty miles north of Port Radium. The lodge first opened in 1965 and has changed owners several times. The lodge did not operate in 1970-71 and went bankrupt in 1973. The present lodge operation has a capacity of 34 beds. The lodge is serviced by Hawker-Siddley 748 from Edmonton to Port Radium and guests are then ferried to the lodge by float plane. Fishing activity occurs in the northern half of McTavish Arm, including side trips to two outposts on the north shore of McTavish Arm, Takaatcho River and Hornby Bay. Arctic Circle Lodge also offers side trips to the arctic coast for charr, although no outpost camp is operated.

The last lodge built on the lake, Great Bear Trophy Lodge, is situated on the western end of Smith Arm in Ford Bay. The lodge has a capacity of forty guests, and in addition oper-

ates an outpost camp at Good Hope Bay. Angling occurs in the Smith Arm, with trips of up to 35 miles not uncommon. Side trips for charr fishing are offered, as well as trout fishing on Lake-De-Bois on a fly-in basis. Great Bear Trophy Lodge is served by fan jet from Edmonton to a private airstrip.

Anglers. Annual licence sales by the sport fishing lodges on Great Bear Lake, excluding the vendor in Fort Franklin, indicate that an average of 1430 anglers purchased licences to fish on Great Bear Lake each year during the period 1973-1982 (Table 6). During that period, approximately 85% of the licence sales were to non-resident anglers (Table 7).

There is not a one-one correspondence between licence sales and lodge guests, since some lodge guests purchase licences from vendors other than lodges and the lodges sell licences to staff (including guides) as well as their guests. Creel studies conducted by the department have included estimates of the relationship between licence sales and guests which suggest that Great Bear Lake licence sales tend to differ from the department's estimate of guests by 7% on average (Appendix 1). If this factor is indicative of the relationship between licence sales and guests, there are approximately 1 300 lodge guests participating in the Great Bear Lake fishery each year.

Angling Effort. The lodges sell package plan services to their guests, usually of 8 days in duration. With the exception of rotation days and inclimate weather, lodge guests typically spend from early morning to late afternoon fishing (Falk et al. 1973).

Angler Harvests. The department has conducted creel census studies on Great Bear Lake since 1971. With the exception of 1972, during which time an extensive creel study was initiated at four lodges and estimates were provided by the one lodge not surveyed, the estimates are specific to lodge areas. The estimated harvests of lake trout from lodges on Great Bear Lake for the period 1971-80 are presented in Table 8.

In 1972, the total harvest of lake trout was estimated to be 46 897 kg (Falk et al. 1973), an amount which likely represents an upper limit on the lodge harvests from the early 1970s. Prior to the regulation changes effected in 1977-78 which reduced anglers' catch and possession limits, 4 subsequent creel studies estimated total harvests less than 1972 levels, one was approximately equal, while three were greater than 1972 levels, but only by amounts of 2500 kg. or less. Subsequent to the regulation change, harvest levels declined to 42% and 50% of their 1972 levels for the two creel studies conducted.

Published data suggest that average daily lake trout catch rates for the 9 creel studies conducted from 1973-1980 ranged from 0.65 - 1.75 trout per angler-hour (Table 9).

Economic Benefits. The gross direct economic benefits to Canada of the Great Bear Lake fishery include (a) the licence revenues derived from non-resident angling activity and (b) the licence revenues derived from Canadian resident angling activity plus the consumer surplus enjoyed by resident anglers, as measured by the amount anglers would be willing to pay above and beyond what they actually pay for access to the fishery. Licence revenues are well documented; non-price benefits to Canadian resident anglers are unknown.

The licence revenues for Great Bear Lake lodges and the Fort Franklin vendor indicate that total licence revenues in 1982 were $15 565 (Table 10). Insofar as these licence revenues accrue to the Government of the Northwest Territories and the bulk of the Canadian resident fishing activity on Great Bear Lake is by participants other than residents of the Northwest Territories, the direct economic benefits to the NWT would equal $15 565.

The secondary benefits from the Great Bear Lake sport fishery include the revenues earned by the lodge industry and the resulting economic impacts on other sectors of the economy. The available information, while it is not specific to Great Bear Lake alone, provides some indication of the extent of the industry's impacts.

Topolniski (1982) estimated that the NWT lodge industry had gross earnings of $6 994 000 in 1980, earnings allocated to wages and salaries ($1 501 000), to capital ($814 000) and to the purchase of goods and services ($4 679 000). The value added of the lodge industry was estimated to be $2 315 000; through the purchase of goods and services an additional $2 377 000 of value added was created at an earlier stage of production. The total economic impacts of the lodge industry were estimated to be such that the income multiplier for all of Canada was 2.15 and the employment multiplier 1.59. The income multiplier indicates that for every $1 of value added in the lodge industry and its direct suppliers, that an additional $1.15 is created throughout the Canadian economy. Similarly, the employment multiplier indicates that for every 100 jobs in the lodge industry and its direct suppliers, that 59 additional jobs are created throughout the economy. However, many of these impacts arise outside of the Northwest Territories, as reflected by the NWT regional income multiplier of 1.33 and the NWT regional employment multiplier of 1.19.

Great Bear Lake and Great Slave Lake lodges were estimated to have gross earnings of $3 809 000 for the 3021 guests they were estimated to have served, an average of $1260 per guest. In the opinion of the working group, Great Bear Lake lodges may have generated approximately $2 500 000 of this revenue. In turn, using industry averages, the value added of the Great Bear Lake lodges is estimated to be approximately $800 000 and the value added of suppliers $1 200 000.

Direct employment in Great Bear Lake lodges, as reported by lodge operators, averaged 225 individuals in the period 1979-1982 (Table 11).

Management issues

The management of the fishery has been developed with the objective of preserving high

quality sport fishing. The management strategy has been to control the numbers and bed capacities of the lodges and to place special catch and possession limits on anglers. The regulation of bed capacity, given assumptions of the normal operating season and normal duration of stay of guests, provides an indirect control on the number of participants in the fishery and the effort expended. The angling regulations limit the maximum harvest by each angler and dictate the licence fees paid for access to the fishery.

The Travel Area Development Regulations were brought in force by GNWT in 1965 in response to concerns with over-harvesting of fish resources on the Arctic Coast and on Great Bear Lake. The regulations restricted tourist establishments (lodges) in specified development zones to their existing capacity and stated no licences for additional tourist establishments would be issued in these zones. All of Great Bear Lake, except for Keith Arm and Smith Arm, was affected by these regulations. The two lodges not in the Travel Development Area were in effect regulated a few years later when then Commissioner, Mr. S.M. Hodgson, said there would be no more development of sport fishing lodges on Great Bear Lake.

The Department of Fisheries and Oceans, through the Northwest Territories Fisheries Regulations, specifies the terms and conditions of the angling licence. For Great Bear Lake, the catch, size and possession limits for lake trout allow for a maximum daily limit of 2 fish and a maximum possession limit of 3 fish. Anglers are allowed to take home 2 lake trout of which only one can be over 712 mm (28 inches) fork length. There are also catch and possession limits for other game fishes. Annual licence fees of $5 for residents and $15 for non-residents are currently in effect, with all persons between the age of 16 and 65 required to have a valid fishing licence.

Biological investigations of Great Bear Lake provide an indication of whether or not the biological goal for fishery management is being met. Yaremchuk (in preparation) observes that:

1. lake trout populations appear to be stabilizing after a period during which the standing stock was being reduced as populations adapted to the advent of fishing pressure;

2. large historical yields of lake trout, particularly of large fish, resulted from the fishing down of large standing stocks which had accumulated due to extremely low natural mortality;

3. equilibrium yield of lake trout, particularly of extremely large fish, is much lower than historical yield. The maximum sustainable yield is estimated to be 0.36 kg./ utilized ha.;

4. lake trout grow very slowly once an age of 27 years and a length of approximately 650 mm is reached; the annual production of fish larger than 900 mm is extremely low;

5. larger sustainable yields could probably be taken at most lodges, but this would be achieved through a shift in the composition of harvests, with more, smaller fish being harvested;

6. a management strategy which maximizes the yield of fish longer than 900 mm would require adoption of strategies which would reduce total weight yields to approximately one half of current yields;

7. a management strategy which maximizes the yield of fish longer than 700 mm would be consistent with the current utilization and harvest;

8. lake trout on Great Bear Lake appear to be sedentary, although some fish do move large distances.

It appears the biological goal of ensuring fish resources are conserved is being met by the current management strategy, since lake trout populations are thought to be stabilizing. The biological investigations have also identified a range of biologically acceptable alternatives in the choice of use of the fish resources allocated for the sport fishery. Insofar as all of the alternatives satisfy the biological goals of management, it is necessary to rank their economic merits in the development of a management plan.

Fishing quality. There is a requirement to select which quality attributes the Great Bear sport fishery should be managed for, and to tailor the regulation of angling effort and harvest accordingly. The department has to decide whether its fishery management goals are best met by a choice to maintain effort and harvest at current levels and current quality, or whether it would be better to vary effort, harvest and quality.

In the review of economic principles (pp. 8-9), the relationship between quality and economic value was described and it was concluded the higher the quality, the more valuable the fishery. There are several quality "attributes" which resource managers can influence through their regulation of the fishery, the most obvious choice being whether to manage for the size of individual fish or numbers of fish harvested. Which of these attributes is more important depends on anglers' preferences, and whether these preferences can be reinforced by both a willingness and ability to pay.

Attitudinal surveys have provided some insights to the importance of fish attributes. A study conducted by the department in a pretest for the 1975 national angling survey indicated 2/3 of the anglers surveyed preferred size of individual fish to number of fish (Department of the Environment, 1974). Topolniski's survey of the lodge industry (1982) indicated lodge operators felt the opportunity to catch large fish was the single most important (31%) resource attribute in attracting clients to their operations. By contrast, only 10% of the operators felt the numbers of fish were the most important attribute. The opportunity to experience northern environments, other recreation activities

and the unique species available for harvest all rated ahead of increased numbers of fish should there be a substantial decline in the proportions of large fish.

These studies suggest anglers and lodge operators would prefer a management strategy which will maximize the yield of large fish rather than a management strategy which would maximize sustainable yields with the resulting shift in the composition of harvests to more, smaller fish.

The marketability of Great Bear Lake sport fishing, in the early stage of development, hinged on the provision of high quality fishing, where quality was synonomous with large numbers of large size lake trout. The fishing down of large standing stocks has resulted in lower than historical yields. Currently, with the restrictions on both numbers and size of individual fish in the interest of providing a more realistic "trophy fishery" (Moshenko and Gillman 1978a), the resource attribute being marketed is the opportunity to catch a large lake trout.

Great Bear Lake has been differentiated from other fishing sites by virtue of its unique resource attributes. Should there be a shift in management strategy, it is likely that the competitive position of Great Bear Lake would be adversely affected, perhaps substantially. Including Northern Ontario, the prairie provinces and other sites in NWT, there are some 1500 lodges and outfitting services which provide access to freshwater fishing. Should the resource attributes of Great Bear Lake change dramatically, it is highly likely that anglers would select from the numerous, lower cost fishing sites which could provide comparable fishing quality.

While these are some of the factors to be considered, there will have to be a choice made between two rival management strategies. It will be necessary to decide whether it will be better to adopt a management strategy (a) of maximizing the yield of larger fish or (b) of maximizing the sustainable yield, resulting in harvests of more, smaller fish.

The second management issue, which really follows from the first, is to decide how many anglers, how much fishing effort, and what harvests will be allowed on Great Bear Lake. This issue follows from the first because of the biological relationships between yield and effort. If it is decided preferable to manage for yields of larger fish, it will require more stringent restrictions on anglers and angling effort than if the fishery is managed for the yield of more, smaller fish. To be specific, a management strategy which would maximize yields of fish longer than 700 mm. is thought to be consistent with existing angling effort in the areas now used. The maximization of yields of even larger fish would require a reduction of effort from current levels. Fishing effort could be expanded beyond current levels if the fishery were to be managed for maximum sustained yield.

There will also have to be consideration of the potential for sport fishing in areas not currently used. Insofar as the existing lodges have expanded their operations in all fishable areas, excluding the Keith Arm, the areas for further expansion are limited. Within the Keith Arm, there will have to be consideration of the most likely future operations of the Sah Tew Lodge, Fort Franklin and the extent to which sport fishing activity in the Keith Arm will increase as a consequence of the recently completed hotel complex. Once the role of the sport fishery in Keith Arm is identified, it will also be necessary to identify the specific locations, yields and numbers of participants that the sport fishery in this part of the lake should be managed for.

Economic benefits. One of the critical factors to be considered in selecting a management strategy for Great Bear Lake is that a higher quality fishery is potentially a more valuable fishery. Equally important is to assess whether this potential is being realized and, if it is not, what measures need to be considered to achieve the best economic benefits from the fishery.

Currently, the gross economic yield of the sport fishery equals the $16 000 of licence revenues plus the non-price benefits accruing to residents of Canada who participate in the fishery. If the primary costs of managing the fishery were subtracted from these benefits, the net economic yield would approach zero. The current sharing of benefits and costs, however, provides an unequal distribution of benefits and costs, with revenues accruing to all N.W.T. residents and costs being borne by all Canadians.

The net economic yield approaches zero because of the policy choice to provide access to Great Bear Lake sport fishing at nominal prices. In effect, anglers are charged less than they would be willing to pay if they had to. Not only do they receive this non-priced benefit (the consumer surplus), in the event that management costs exceed direct revenues, they would receive a subsidy from the federal treasury. The rationale for this pricing policy is not documented. It may simply be the result of applying pricing policies common to fish management agencies in the rest of Canada - policies which are generally administratively determined and have no economic basis. Such pricing policy does provide equality of access to participants, but the rationale for its use in the management of non-resident fishing is debatable. A more plausible reason for the pricing policy is that nominal prices are charged in the interest of stimulating regional employment and income impacts. In other words, primary benefits are traded for secondary benefits. This is the equivalent of a "loss-leader" approach to the marketing of the fish resources of Great Bear Lake.

Great Bear Lake lodges are estimated to generate in the order of $2 500 000 in gross sales each year and to contribute approximately $800 000 in wages, salaries, profits and rents. The direct employment in lodges has been estimated to be 225. While the impacts appear substantial, it is also important to consider where they occur. Because the logistics of the industry involve guests being flown into the north from major centres in southern regions, there is

a tendency for lodges to service their operations from these centres. Furthermore, southern regions provide a larger pool of economical labour services, which lodges often draw from in staffing their operations. While these are perfectly rational decisions which enable lodge operators to minimize their costs of production, the consequence is that much of the economic impact occurs outside of the NWT. The "leakage" of employment and regional income from the north to southern centres has been a long standing concern to communities in the north, and to those federal and territorial agencies charged with northern economic development (Federal Territorial Task Force 1972).

It appears the Great Bear Lake fishery is not contributing to the stated goals of the department, since the fishery is not providing a direct economic yield in the form of a resource rent. This situation exists because there is no economic rationale to how the department prices access to the fishery. Furthermore, it appears the fishery does not contribute fully to the regional development goals of GNWT and DIAND, because of the "leakage" of economic impacts from the north. The logistics of the lodge industry suggest it is most likely lodges will continue to operate this way in the future. Changes to this arrangement will only be achieved through regulations of the operating patterns of lodges, as might result if lodges were required to purchase more of their supplies and labour services in the north.

By contrast, pricing access would enable the department to provide a tangible, direct benefit from the fishery, by effecting a redistribution of the non-priced benefits from non-resident anglers to the resource owners, all Canadian residents.

The management issue is whether the department should maximize the economic yield rather than the economic impacts provided by the lodge industry. If the fishery is to be managed for economic impact, the department will have to compromise its stated goals for the fishery. In this situation, for economic impacts in the NWT to be maximized, it is also quite likely that GNWT would have to consider regulating the purchasing and hiring patterns of the lodge industry. Whether the costs of such regulation, which would be borne by the lodge industry, are warranted in terms of the regional development benefits which would be provided is a matter for very careful consideration. The alternative of providing financial incentives to the lodge industry in order to achieve these regional benefits poses equally difficult choices.

Of course, the department may adopt the position that it will not compromise on the stated goal of managing the fishery for direct economic yield, including the need to provide a resource rent from the fishery. In this case, it would be necessary to work closely with GNWT in order to assure the fishery provides a desirable mix of economic benefits from both the national and regional viewpoints.

Economic regulation. The review of the management issues suggested that while the biological goal of management has been satisfied, the economic goals were not being met. This largely results from the methods used to regulate sport fishing effort. In the event that the department adopts a management strategy of maximizing the economic yield from the fishery, it will be necessary to consider how best to regulate the fishery. Accordingly, a review of the methods available was initiated by the working group.

Four criteria, taken from the goals for fishery management, were used to evaluate the alternatives;

1. resource conservation - would fish resources be conserved?
2. economic efficiency - would the economic benefits be as large as possible? What would be the effects of regulation on the economic value of an angler-day?
3. economic rent - would the economic rent potential be realized? Would economic rent be captured by the resource owners or the resource users?
4. administrative efficiency - are the costs of regulation and resource assessment as low as possible? How are intra-fishery conflicts to be handled?

First, the existing system of regulation is evaluated and it is concluded that the economic goals for the fishery are not being met and problems of intra-fishery conflict are not readily handled. These conclusions would apply to any system which does not use prices as a means of regulation.

Three alternatives to the existing system were identified. The first is to charge more than a nominal price for a fishing licence. The second is to charge a royalty on harvests of trophy fish. The third alternative is a system of quantitative sport fishing rights in the form of leases, analogous to systems of quantitative commercial fishing rights (Moloney and Pearse 1979). While the following evaluation of alternatives is preliminary and qualitative, there appear to be distinct differences in the effect of the regulations. Each of these systems could be designed to meet the biological goals of management and to change the distribution of benefits from the fishery. However, there appear to be differences in economic efficiency (the total benefits may vary) and in the ease with which intra-fishery conflicts could be handled. Necessarily, should an alternative regulation system be recommended for Great Bear Lake, further analysis would be needed prior to implementation.

Existing system. The existing system was described on pp. 38-39.

resource conservation. The resource conservation goal is thought to be satisfied by the existing system, since lake trout stocks have probably stabilized. However, in light of the strict catch and possession limits for lake trout (1 trophy fish per angler) now in effect, there is very little flexibility remaining in the system and it would be difficult to adapt to

a decline in fish stocks. Furthermore, the existing regulations depend on there being no change to the rotation pattern of guests. If the rotation pattern were shortened from current norms, there would be more anglers on the lake. Since each would be entitled to harvest a trophy fish, the total harvest may increase.

economic efficiency. The economic model of sport fishing can be used to demonstrate the effect of bag limits on economic value. The bag limits diminish the quality and economic value of each day of fishing, but allow for more days of fishing at the lower quality. Whether the regulation improves or worsens the potential benefits from the fishery requires a comparison of how much value is lost each angler-day (area A) versus how much is gained from the additional angler-days at lower quality (area B), as illustrated in Figure 12.

The restrictions on bag limits for lake trout in Great Bear Lake are very strict, particularly so because of the extended stay for many lodge guests. There is a real possibility that many lodge guests feel the value of their fishing trip has been diminished by the Department's regulations. However, it is not known whether the regulations have had an adverse impact on the total economic benefits in the fishery, since the tradeoff referred to above cannot be evaluated without a detailed study.

The existing system does not provide lodge operators with any flexibility in making choices on fishing quality subject to the overall resource conservation requirements.

economic rent. The existing system does not provide an economic rent, largely because the system emphasizes quantity restrictions on both angling effort and harvests rather than price restrictions.

administrative efficiency. The existing system is not complicated and, as a result, the costs of management are reasonable. However, because of the existing pricing policy, low costs are matched with even lower revenues and the fishery does not contribute directly to the economic wealth of Canada.

Second, because the prices are arbitrarily low, there is no market data which can readily be used to assess the value of the fishery. This creates problems when intra-fishery conflicts arise and there is a need for an economic appraisal.

Licence fees (pricing inputs). This alternative would use licences and licence fees as a means of achieving the goals of fishery management. This would be a significant departure from the existing system, where licences and licence fees serve only the administrative and enforcement requirements of the department.

There are two choices which would have to be made. First, whether or not there should be a limit on the number of licences available. Second, the price to be charged for a licence. These two areas of choice offer a range of alternatives which might be considered, of which 2 feasible alternatives will be described (this does not mean they are the only alternatives which can be considered).

Both alternatives would limit the total number of licences for the fishery, the maximum number of licences dependent on the sustainable yields available for harvest, the relationship between fishing effort and harvest, and the restrictions on harvests per angler. Each lodge would receive a quota and an allocation of licences. The first alternative would retain the existing, uniform restrictions on all anglers, the second would allow for variable harvesting rights for anglers.

In both alternatives, the department would set a licence price which would capture a share of the benefits of the fishery for the resource owners. The prices would be set with the objective of capturing the consumer surplus now enjoyed by non-resident anglers and the economic rents from the fishery. The relationship between such "economic" prices and the current, arbitrary prices, is unknown. However, it is clear that the licence price would be greater, perhaps significantly greater, than the current licence fees.

The evaluation of a licence fee system, relative to the four criteria outlined above, indicated that:

resource conservation - both alternatives would satisfy the resource conservation goal, since the fishery would be managed by quota.

economic efficiency - both alternatives would allow for efficiency gains. The second alternative, with variable fishing rights, allows for greater efficiency provided that the value of additional fish to some anglers is greater than the benefits of the fishery with uniform restrictions on all anglers (the situation described above and illustrated in Figure 12). The point is that lodges would have the ability, subject to the annual quota, to market fishing rights in the way they felt most advantageous. Because lodges would be free to allocate fishing rights among their clientele, the economic value of their allocation may improve.

Economic rent. Both alternatives would change how benefits from the fishery are shared. They would result in a re-distribution of benefits from non-resident anglers to the resource owners. Therefore, both alternatives allow resource owners to capture the economic rent from the Great Bear Lake fishery.

Administrative efficiency. Both alternatives would require additional biological assessments in order to establish lodge quotas. As well, both alternatives would require only minor modifications to the sport fish regulations, in order to set specific licence fees for Great Bear Lake. The enforcement costs in the first alternative should be no more costly than the existing system. The second alternative would likely require closer enforcement to ensure that the total fish harvests do not exceed the quotas.

Both alternatives would provide tangible, direct measures of the value of the allocation

of fish resources. The availability of meaningful market data would be extremely useful in deciding how to resolve intra-fishery conflicts.

Care would have to be taken to ensure the costs of regulation do not exceed the potential benefits. Even though gross revenues increase, in the event that costs increase more than revenues, the net economic yield would not improve.

Royalty on trophy fish (pricing outputs). This alternative would use a tax on trophy fish as a means of achieving the goals of fishery management.

This alternative would require similar choices as the licence fee alternative. There would be a requirement to determine the sustainable yields and to allocate a quota and licences to each lodge. There would be the opportunity to either retain the existing restrictions or to allow for variable fishing rights, as described in the previous alternative.

The department would set the tax which would capture a share of the benefits for the resource owners.

resource conservation - the fishery would be managed by quota, so the resource conservation goal would be satisfied.

economic efficiency - the alternative where lodges have the opportunity to allocate fishing rights among their clientele is potentially the more efficient of the two approaches discussed. This was explained in the description of the licence system alternative.

economic rent - a price or royalty payment for each trophy fish would change the distribution of benefits from the fishery, as with the licence alternative. There would then be an opportunity to provide an economic rent from the fishery.

administrative efficiency - this system is potentially more expensive than the licence system alternative, because fish harvests would have to be monitored very closely. As well, a method of recovering the royalty payment would have to be developed. Both of these requirements may be costly to implement.

This system would provide a tangible measure of what the department really needs to know in allocating fish resources - the value of a fish in recreational use. This would provide important data for resolving intra-fishery conflicts.

Leases for fishing rights. This alternative would involve a lease being offered to each lodge at a negotiated rental price. The terms of the lease would detail sustainable yields and the number of trophy fish available, the number of licences, and the areas of operation. The lease might allow for the leaseholder to sub-let areas and or numbers of fish. The length of the lease would have to be specified.

One alternative to the flat payment for the lease is a system of low rental payments plus royalty payments on harvests, the level of the royalty payment subject to periodic negotiation. This option is not explored below, since the intention is to describe generally rather than in full detail how a system of leases would operate.

A market for fishing rights would emerge if quantitative and transferable fishing rights were developed.

resource conservation - the fishery would be managed by quota, so the resource conservation goal would be met.

economic efficiency - there is general agreement by economists that a system of quantitative fishing rights is best suited to the economic goals for commercial fishery management (Moloney and Pearse 1979). Through the provision of quasi-property rights, the economic problems of open-access, common property management are eliminated. Given an allocation, each fishing enterprise plans to minimize their harvesting costs rather than increasing their costs in the search for as large a share of the harvest as possible. The transferability of rights allows for resources to be put to their highest valued use. It is the working group's view that leases for fishing rights offer the same potential advantages for lodge-access fisheries. The risk and uncertainty which now characterizes the industry in Western Canada because there are no explicit fishing rights would be eliminated. Leases for fishing rights would provide desired stability.

Lodges would have the incentive to use their allocation of fishing rights as efficiently as possible. The transferability of fishing rights would promote efficiency of operations, rights being "sublet" if their market value is greater than their value in production. Conceivably, the trading of fishing rights would allow individual lodges to expand or contract their operations, removing the need for government to regulate the scale of their operations. These adjustments could occur because the resource conservation goal would be satisfied through the quotas set for the fishery.

Transferable fishing rights could also be used to address conflicts in use. The transfer of fishing rights between sport and commercial use would be possible through negotiation between interested parties. Transfers of rights would result in those most willing and able to pay for the rights actually holding the fishing rights. Again, the resource conservation goals of the department would be met by the conditions of the leases.

Economic rent. The negotiated rental price would have to be sufficiently high to ensure that resource rents could be obtained for the resource owners. Otherwise, the rents would accrue to the resource users, as is thought to result with the existing system (p.16).

Administrative efficiency. The major advantage of this system is that a market for fishing rights could be developed, facilitating changes in resource use whenever those changes are economically efficient. This, of course, is what the department has stated as a goal for its fishery management programs.

In summary, there are a variety of regulatory systems which could be developed in order to achieve the fishery management goals of the department. As described above, each of these systems has relative merits and shortcomings. The management issue is to select one of these for the future management of the lodge-access sport fishery on Great Bear Lake.

THE ITINERANT SPORT FISHERY

The itinerant sport fishery includes all anglers who make their own arrangements to sport fish Great Bear Lake. This fishery includes the day-use sport fishing by those who live on the lake, as well as the extended stay fishing by those who arrange their own travel.

Itinerant sport fishing is presently not an issue of concern, since there is very little fishing activity. However, the working group examined this fishery in order that some thought be given to how the management plan would handle an expansion in itinerant fishing effort.

The working group has described earlier (p. 14) the need to have some form of direct control on total fishing effort in order to maintain sport fishing quality. For this principle to be applied, it would be necessary to include itinerant fishing effort in the total allowable fishing effort and regulate the fishery accordingly. This raises a management issue insofar as the control of access to sport fishing is at conflict with residents perceived right of open-access to sport fish opportunities.

If this right is considered unalterable, there will be no problem as long as there is very little fishing activity. However, if there is no control on an expanding itinerant fishery, there will be an adverse impact in the values derived by other users. At issue will be whether it is desirable to trade the values in other uses in order to obtain resident sport fish benefits.

If it is decided that itinerant fishing should be controlled, it will be necessary to consider how best to regulate fishing effort. One possibility is that the department could hold in reserve a portion of sustainable yields for itinerant angling, and issue a limited number of licences specific to this fishery. Depending on the regulatory mechanism selected for the lodge-access sport fishery, it might also be possible to provide lodges with the right to market itinerant fishing opportunities.

COMMERCIAL FISHERY DEVELOPMENT POTENTIAL

The community of Fort Franklin, through the Band Economic Development Committee, has identified the development of a commercial fishery as a priority project. In a September, 1982 submission to the department and Renewable Resources, GNWT, the committee concluded;

"We are convinced that the project is viable and long overdue. With economic conditions in the north and south as they are today, the marketing prospects are assured for an annual harvest. What remains to be negotiated is the final quota of fish to be alloted and an assurance that this project is exclusively for the benefit of the Sahtu Dene."

This section examines the commercial fishing potential of Great Bear Lake, identifying the potential revenues and expenses of the fishery. This analysis evaluates the viability of the fishery, identifies the major constraints to development and examines the resource management issues which arise from the proposed development.

Feasibility Analysis

Outline of Proposal. The community requested a total quota of 30 000 trout and whitefish from 18 fishing areas on the lake, as well as 10 000 herring from various, unspecified locations. Fish would be harvested both in summer and winter. Open water fishing was proposed for locations at varying distances from the community. Fishermen would deliver their production from fishing grounds within a 10 mile radius from the community; beyond this distance, a freighter boat would be used to transport production to the plant.

The proposal indicated the plant would be used for either fresh fish packing or whole freezing of fish harvested. The fishery would operate on the basis of "pre-determined sales", so it was thought that much of the production would be graded, iced and packaged for shipping upon delivery to the plant. Whole frozen product would be produced only in the event that harvests exceeded the "pre-determined sales".

The proposal suggested that marketing of the product would emphasize local sales, with the majority of fish being marketed in the communities near Fort Franklin. High priority, for example, would be given to the communities closest to Fort Franklin such as Fort Norman and Norman Wells. It was also suggested that major markets would be developed in both the Inuvik region and the southern N.W.T.

Harvest logistics. The working group initiated a feasibility analysis to assess the commercial fishing proposal. With a few exceptions, the analysis simulates the workings of the fishery as outlined in the community proposal. In order to allow for critical examination of this analysis the assumptions about resource availability, harvesting, processing, transportation logistics and market potential are described.

This analysis assumes that the volume of trout and whitefish available for all uses in the Kieth Arm is most likely to be 25 000 kg, at minimum is 10 000 kg and at maximum is 50 000 kg. Harvestable volumes of whitefish from the Johnny Hoe River are most likely 10 000 kg, at minimum 5 000 kg. and at maximum 20 000 kg. The most likely volumes of whitefish available from the Whitefish River at 7 500 kg, the minimum 5 000 kg and the maximum 10 000 kg. These

estimates are preliminary and subject to revision upon detailed biological assessments.

Historically, residents of Fort Franklin have harvested minor amounts of whitefish through the summer and fall in Russell Bay, Keith Arm. Good whitefish harvests have been noted in Deerpass Bay in the fall spawning run and in Cloud Bay in the spring and fall. The analysis that follows assumes that commerical fishing occurs in Deerpass Bay and Cloud Bay, with any volumes greater than the Keith Arm maximum allowable harvests taken from the Johnny Hoe and Whitefish Rivers. The analysis assumes that fishing occurs during the fall spawning run, when whitefish catch rates would be highest. Should the fishery operate in different times of the year, the costs of fishing would increase and other factors constant, the viability of the fishery would decline.

Fishing enterprises would consist of 2 man units, fishing vessels being 6.1-6.7 m canoes powered by outboard motor. The fishery would be a gill net fishery, with each enterprise fishing 5 nets of 14 cm mesh. Catch rates of 40-70 kg per 91 metre set per 24 hour period during the whitefish fall spawning run, as observed on the Little Buffalo River, NWT, are considered the upper limit on fishing productivity. It is assumed that all fish harvested in the Keith Arm are whitefish, by virtue of the fishing during the spawning run.In the Johnny Hoe and Whitefish Rivers it is assumed that selective whitefish fishing is possible with gill net fishing at river mouth timed with the fall spawning run. Should the assumptions on selectivity of fishing prove unrealistic it would be necessary to conduct the feasibility analysis assuming a maximum tolerance level on incidental trout catches and differences in product prices would have to be calculated to reflect the change in product mix.

Fish harvesting costs have been estimated using the mean variable fishing costs for skiff operations in Western Canada producing 2 268 kg or less. These costs, based on a 1977 survey of fishing operations by Thompson (1981), were escalated to 1983 costs using the consumer price index. The costs include allowances for daily food provisions and they also include a renumeration of $50 per day for each fisherman and helper.

The capital investments for a skiff enterprise are estimated to be $5 000. The analysis initially assumes the full capital costs are to be charged to the commercial fishing proposal. Subsequently, the effect of charging only 20% of the costs to the fishery is examined, the rationale being that vessels and fishing gear are already used for other purposes and these uses should absorb a portion of the investments in fishing boats and motors.

The harvest transportation logistics require the delivery of fish from the fishing grounds to Fort Franklin. While the community proposal indicated that harvests would be transported by 12.1 m whitefish boat, preliminary estimates suggest that boat transport would be more costly than air charter. Accordingly, the costs of harvest transportation are based on air transport. Should boat transport be considered preferable, it is estimated this will impose higher costs on the fishery and reduce the net income potential.

The capital costs of a 56 sq. m packing plant are estimated to be $100 000, approximately double the cost of a comparable facility in Western Canada (pers. comm. Ward, 1984). A plant of this size would handle 18 144 kg over a 4 week operating period. The additional cost of cold storage capacity is estimated to be $35 000 to $100 000. The design of the plant does not include provision for freezing capacity.

Plant operating costs are based on known standard costs from plant operations in Western Canada. Plant supervision costs are included in the costs, providing a salary for plant management services, the coordination of harvesting and transportation services and product distribution and marketing.

Target communities for the sale of commercial harvests include Fort Franklin, Norman Wells, Fort Norman and Fort Simpson. To the north, there are fisheries positioned to service local markets in Inuvik and Tuktoyaktuk. To the south, Great Slave Lake serves as an alternative source of supply in the Hay River-Yellowknife regions. Notwithstanding the limited market potential of this southern market, the sensitivity analysis examines the potential benefits of selling fresh fish in Yellowknife, assuming markets pose no constraint. Finally, the implications of selling frozen volumes through the Freshwater Fish Marketing Corporation (FFMC) are considered.

The extent of the market in each target community is unknown. It is not clear how many members of each community would be in the market, nor is it clear what annual per capita consumption would be. The extent to which other fisheries compete in these markets is also unknown. The initial analysis considers a total market volume of approximately 10 886 kg of final product weight (13 608 kg live weight). The benefit of selling additional volumes in the regional markets is next considered, then the implications of selling additional volumes in the southern NWT are evaluated. All fresh sales are assumed to be made at a price of $2.76 per kg, prices which are currently being paid in regional markets for fresh whitefish.

Should the fresh fish sales opportunities be less than anticipated, the community would have the option of delivering whole frozen fish to the Freshwater Fish Marketing Corporation, Winnipeg. The current prices for medium dressed whitefish f.o.b. Winnipeg are $.99 per kg. In addition, direct delivery fishermen receive a packing fee of $.155 per kg, so the total price would be $1.145 per kg.

The working group did not include the market potential of serving the ESSO Norman Wells development. This project is short term in nature and the catering requirements for fish would not exceed 3 175 kg in 1984. In fact, it appears that ESSO Resources will meet these requirements from established sources of supply in the NWT, most likely the FFMC Hay River.

Financial prospects. The feasibility analysis, based on harvests of 13 608 kg of whitefish from the Kieth Arm, indicates gross sales of $30 375, expenditures of $71 447 and a net cash flow to the fishery of -$41 072 (Table 12).

The total sales revenue of $30 375 is based on 11 022 kg of final product being sold at a price of $2.76 per kg. Sales adjustments total $12 071, an amount which largely consists of the costs of transporting product from Fort Franklin to market areas.

The plant costs include operating expenses of $15 874, fixed operating costs of $4 850 and depreciation and interest costs of $13 000. The resulting net income on plant operations is -$1 976. Taking account of the amortized investment on the plant which equals $16 275, the net cash flow on harvesting operations equals -$5 251. This is the amount available to fishermen, equal to a negative price of -$0.485 per kg of production.

Variable harvest costs, including a daily wage for fishermen and helpers, total $26 450. The fixed operating costs are $3 675 and vessel depreciation and interest costs equal $4 550. The net cash flow from harvesting operations, which takes account of the amortized investment in fishing vessels, equals -$41 072.

This analysis suggests a fishery of this scale would not be financially viable. This outcome is suggested for two reasons. First, the fixed costs of the fishery (the capital costs of plant and fishing enterprises) are very high and absorb 73% of product value. Secondly, the variable costs of production are very high in relation to product prices, with sales and harvest transportation costs alone absorbing 55% of gross sales. Since the variable costs exceed revenues by $.97 per kg., there is no positive contribution to profits and fixed expenses.

The breakeven quantity analysis indicates the volume of production where total revenues just equal total costs. Because variable costs exceed price, there is no production level where total revenues equal costs. The breakeven price analysis indicates the price where revenues equal costs, given the volume of production. The breakeven price is $6.48 per kg., more than double current market prices for fresh whitefish in regional markets.

Sensitivity analysis: prorated fishing costs. This analysis considers the effect of allocating part of the capital investments in fishing operations to domestic fishing and private transportation. If 60% of the investment costs are allocated to these other uses and 40% to commercial fishing, the annual fixed costs of the fishery would decline by $6 217. The net cash flow from the fishery would then equal -$35 555, still a highly unfavourable outcome. The breakeven price would be $5.98 per kg., still more than double current prices.

The following calculations continue to assume that fishing costs will be prorated to other uses.

Sensitivity analysis: quantity changes for fresh sale. The effect of additional volumes on the financial performance of the fishery was next considered. Because the fixed costs of the fishery impose a large constraint on feasibility, more volume may improve the financial performance. The results of this analysis suggest that net cash flows would increase as production expands in regional markets, but would decline once the volumes are harvested for sale in the southern market (Table 13).

The net cash flows initially increase as a result of declining variable labour costs for fishermen and their helpers, consistent with the assumption they receive renumeration equal to a daily wage. However, this reduction is offset by increases in sales transportation costs as volumes are moved to the more distant southern markets. The combined effect is that the net cash flow declines as volume increases.

Sensitivity analysis: quantity changes for frozen sales. The preceding analysis assumed that fresh markets exist in the NWT which will absorb all volumes produced at a constant market price. This assumption, while highly questionable, proved to be irrelevant because of the high costs of production. Nevertheless, it is considered important to consider what would happen if the fishery were developed, regional markets proved to be limited and it were necessary to market whole frozen volumes through the FFMC.

Predictably, this would alter the operations and financial performance of the fishery considerably. The capital investment in plant and equipment would increase, with the estimated added cost of cold storage capacity being $85 000. Plant operating costs would increase since product would be plant frozen, requiring extra labour and increasing the energy requirements for the plant. While there may be cost savings in shipping frozen rather than fresh product, the most significant change is that product value would decline from $2.76 to $1.15 per kg.

The sensitivity analysis suggests that net cash flows for all levels of production are lower than for the fresh sales analysis. Even when volumes are sold fresh in the regional markets, the net cash flows are reduced because of the higher amortized costs of plant and equipment. There are marginal improvements as long as volumes are sold in regional markets, but beyond the 27 216 kg production range the net cash flows decline substantially (Table 14). The projected losses are greater than or equal to the revenues realized beyond a productivity range of 77 628 kg.

Conclusions. The following conclusions are drawn from the feasibility analysis:

1. A commercial fishery harvesting 13 608 kg. of fish for fresh fish sale does not appear to be financially viable;

2. The financial viability does not change significantly when the capital costs of fishing vessels are prorated to other uses;

3. The net cash flows from the fishery would improve as long as additional volumes are sold in regional markets, but the cash flows would still be negative;

4. The net cash flows would decline if additional fish harvests were surplus to regional markets and were sold fresh in southern NWT markets;

5. The net cash flows would decline substantially if additional fish harvests were surplus to regional markets and were sold whole frozen to the Freshwater Fish Marketing Corporation;

6. The economic rent potential of fish allocated to commercial fishing development is nonexistent under projected revenue and costs conditions.

It must be emphasized that the working group's analysis is not suited to the evaluation of fishing for "local sales".

Management issues

The commercial fishery proposal raises both biological and economic issues. The biological issue arises from the limited information on the resource in the potential areas of development. The working group has identified the need to initiate biological investigations to assess the resource base in the Kieth Arm, Johnny Hoe and Whitefish Rivers in order to identify the annual sustainable yields from each area.

The economic issue is how available resources from the above mentioned areas should be allocated among competing uses. Departmental policy clearly states the native domestic fishery will take precedence over other uses of the resource. Beyond that, the management issue is to allocate fish resources to either commercial or recreational uses. This is indeed a problematic issue in light of the limited potential which now exists for a commercial fishery, the presence of recreational fisheries in proximity to the Johnny Hoe and Whitefish Rivers, and the requirement to plan for sport fish development in Kieth Arm for the Sah Tew Lodge and the new hotel complex. One management issue is the need to identify the potential impacts of commercial fishing on recreational fishing. Where there are adverse impacts, it will benecessary to decide, using objective criteria, which type of fishery will take precedence.

Where there are no adverse impacts, it will still be necessary to assess the economic potential of commercial fishing. The existence of fish resources surplus to domestic and recreational requirements does not, by itself, lead to the conclusion that a commercial fishery should be developed. The working group's analysis of commercial potential suggests that even if the fish were provided free of charge, the development would not be capable of providing economic returns to the labour engaged in fishing operations or the capital invested in the fishery. Significant cost and marketing constraints remain, even when there are no constraints on fish supplies. In the absence of public support, the commercial fishery will be short lived under existing cost and price conditions.

The issue for the agencies concerned with economic and social development is whether or not they view the benefits of development to be greater than the net financial costs and whether or not they are willing to provide public funds in support of a development with extremely unfavourable financial prospects. If they are willing to provide public funds in support of development, there is the additional issue of deciding under what conditions the department should provide an allocation of fish for commercial use. As with the domestic fishery, the working group emphasizes the need to ensure that government programs which provide financial assistance for commercial fishery development are coordinated with ongoing management plans for the fishery.

MANAGEMENT OF RESOURCE USE CONFLICT

There is the possibility that the existing, implicit allocation of resources will prove to be less than satisfactory over time. The management issue is to develop a mechanism which will enable these conflicts, should they arise in the future, to be resolved in the best way possible.

There are several choices which will have to be made. First, there has to be a decision made to either rely on the existing system of solving resource use conflict or to move to a market based solution. The existing system essentially requires that the department evaluate the relative merits of competing uses and allocate resources to their most valuable use. In this approach the department endeavours to simulate the workings of a market mechanism and reach a "best use" solution. The alternative is to actually create a market for fishing rights and, providing that rights are transferable, allow for fishing rights to be traded. Through this process, the fish resources would be allocated to their highest valued use.

There will have to be related choices on what consultative mechanisms are best suited for the ongoing management of the fishery. There could be a continuation of the existing system where the department consults with users as necessary, but by and large identifies, evaluates and carries out its responsibilities for fishery management. Alternatively, the department could develop a formal structure to consult with resource users, perhaps by forming a management advisory board. This is the approach being used on Great Slave Lake. In this system, the advisory board provides an opportunity for the department to consult with resource users, exchange information and obtain the views of resource users. Regardless of the approach to consultation, the department must also be mindful of the general public interest when public resources are being allocated, as well as the specific interests of user groups.

THE MANAGEMENT PLAN AND LAND CLAIM NEGOTIATIONS

The objective of the management plan is to ensure the fish resources of Great Bear Lake provide maximum contribution to economic and social welfare. The basis for the department developing the plan is that the fish resources are public resources owned by the people of Canada and the department is charged with the stewardship of the resources in trust for all Canadians. Because there has been no assignment of property rights to the resources, the management plan seeks the use or the combination of uses, within a common property framework, which will provide for the best contribution to economic and social welfare.

Property rights for the fish resources of Great Bear Lake may change as a result of Dene land claim negotiations. While the exact nature of the changes will be determined by negotiation, at minimum, there likely will be some preferential rights to use the land and fish and, at maximum, the granting to the Dene of land and fishery rights. Of course, the negotiations might also result in some "intermediate" combination of preferential use and ownership rights of the land and fish resources. As a result, the fishery management plan must be sufficiently flexible that it can be adapted to both the existing situation where there is no assignment of property rights and future situations where explicit property rights may be assigned.

The working group is of the opinion that the objective of the management plan, to see that the fish resources are allocated to their highest valued use, is appropriate now and for the future. This objective is consistent with the department's interests, being one of the stated goals for fishery management, so it is appropriate now. It is appropriate to the future, since when resources are allocated to their most valued use, there is the best opportunity to create economic wealth. Presumably, the owner(s) of property rights in the fishery would want to ensure the fish resources, being an economic asset, are as productive as possible. A well known economic proposition, referred to as the Coase Theorem (Coase 1960), indicates a resource such as a piece of land will be put to its optimal, or highest valued use regardless of the initial assignment of the rights to it. If the resource owner has an alternative of either using the resource or trading the rights to that resource, he will evaluate which course of action is more beneficial to him and act accordingly. In this regard, there are common interests in ensuring fish are allocated to their highest valued uses in both the existing and future ownership situations.

Second, and perhaps more importantly, is the question of how the benefits from the fishery are to be shared. In the existing situation, where there is no assignment of rights, the distribution of the benefits from the fishery is largely dependent on the departmental policy on pricing access to the resources. As a generalization, when zero or nominal prices are charged the benefits will largely accrue to the resource users; when higher prices are charged, the benefits will largely accrue to the resource owners.

Once there is an assignment of property rights, it is anticipated the owner(s) of those rights will ensure the distribution of benefits is in his (their) favour. Therefore, the discretion which the department now exercises in pricing access to the fishery is likely to disappear as the proprietor(s) of resource rights will likely price the resources to obtain maximum sustainable economic rent. In this regard, the change in ownership rights would be consistent with the existing system provided that resource policy ensures a benefit is provided for the resource owners. Of course, the change in ownership rights would also mean benefits are distributed to a different referent group than "all Canadians".

There has been a reluctance, in light of the uncertainties surrounding the land claims negotiations, to discuss resource management issues in the area of land claims. The fear is that proposals will be inconsistent with the management regimes which will be considered once land claims are settled. For the reasons outlined above, the working group is of the opinion that there is an opportunity to develop a sound management plan for the future and to ensure the management plan complements the outcome of the land claims negotiations. In fact, this analysis may facilitate the negotiating process.

It is in this spirit the working group has initiated its review.

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Appendix 1. Relationship between estimated numbers of lodge guests and licence sales from selected creel studies on Great Bear Lake

Creel Study		Estimated Guests*	Licence Sales	Sample Coverage
1973	Great Bear Lake	428	413	80%
1973	Great Bear	314	315	53
1973	Great Bear Trophy	249	240	62
1973	Cameron Bay	185	180	8
1974	Cameron Bay	259	359	66
1979	Great Bear	215	226	100
1980	Great Bear Trophy	331	387	84
Totals		1 981	2 120	

*The estimated guests are derived by summing the number of guests present each week over the census period. If the census is in fact a sample of the fishery operation, the total number of guests is extrapolated from the sample.

Table 1. Miller's estimate of the 1947 domestic harvest Great Bear Lake

Area	Volume
Port Radium	1 361 kg
Keith Arm	226 799
Johnny Hoe River	725 755
Whitefish	45 360
Total	999 275 kg

Table 2. Cuttman's estimate of the 1973 domestic harvest, Great Bear Lake

Area	Volume
Fort Franklin	22 680 kg
Russel Bay	2 268
Jackfish Point	5 443
Deerpass Bay	907
Johnny Hoe River	13 608
McVicar Arm	4 536
Total	49 442 kg

Table 3. Rushforth's estimate of the 1975 domestic harvest, Great Bear Lake

Species	Volume
Lake Trout	17 854 - 24 930
Whitefish	13 789 - 16 511
Lake Herring	13 699 - 21 918
Arctic Grayling	2 722 - 4 082
Total	48 064 - 67 441 kg

Table 4. Bed capacity of sport fishing lodges on Great Bear Lake

Lodge	Location	Guest Capacity
Arctic Circle	Cornwall Island	34
Branson's	Cameron Bay	40
Great Bear Lake (Plummers)	Dease Arm	54
Great Bear	Sawmill Bay[a]	34
	Bear Island[a]	20
Great Bear Trophy	Ford Bay	40
All	All	222

[a]No guests are presently accommodated at Sawmill Bay; the capacity at Bear Island has increased from 20 to 28 and, in good years 16 guests are permitted to use the Neiland Bay permitted to use the Neiland Bay outpost camp as a base camp operation. The effective capacity of Great Bear lodge has been reduced to 44 guests.

Table 5. Outpost camps of sport fishing lodges on Great Bear Lake

Lodge	Location
Arctic Circle	Takaatcho River
	Hornby Bay
Branson's	Katseyedie River
	Kugaryuak River (Cornation Gulf)
Great Bear Lake	Tree River (Arctic coast)
Great Bear	Neiland Bay
Great Bear Trophy	Fort Hope Bay

Table 6. Licence sales by the sport fishing lodges/vendors on Great Bear Lake 1973-1982

Lodge/Year	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	X[a]
Arctic Circle	-.-[b]	0	170	189	340	289	321	286	298	207	233
Branson's	182	359	247	326	377	262	367	365	324	279	309
Great Bear	315	278	234	174	313	281	225	146	170	206	234
G.B. Lake	413	369	302	370	407	425	338	363	385	317	369
G.B. Trophy	240	225	306	315	321	329	-.-	438	354	290	313
Fort Franklin	-.-	-.-	-.-	-.-	-.-	-.-	101	48	118	-.-	-.-
Total[c]	1150	1231	1259	1374	1758	1586	1352	1646	1649	1299	1430

[a] Average number of licences sold for years in which information available, except for Sahtew Lodge

[b] -.- indicates no information available

[c] Totals will underestimate actual licence sales whenever sales were made by a lodge but no information is available.

Table 7. Resident and non-resident licence sales by the sport fishing lodges/vendors on Great Bear Lake, 1975-1982

Year/Category	Resident	Non-resident	Short Term[a]	Total
1982	449	850	--	1299
1981[b]	352	825	--	1177
1980[c,d]	390	1208	--	1598
1979	375	977	--	1352
1978	384	1202	--	1586
1977	370	1388	--	1758
1976	243	1079	52	1374
1975	197	1001	61	1259
8 Year Average	345	1205	--	1425

[a] Non-resident short term licence discontinued in 1977-78

[b] No breakdown of the 118 licences sold by Fort Franklin vendor or the 354 licences sold by Great Bear Trophy Lodge

[c] No breakdown of 48 licences sold by Fort Franklin vendor

[d] No information from Great Bear Trophy Lodge

Table 8. Harvest of lake trout from lodges on Great Bear Lake from 1971 to 1980

Lodge	Year		Trout Caught	Trout Released	Trout Retained	Release Mortality	Shore Lunches	Total Harvested	Harvest/ Angler
Great Bear Lake Lodge	1972	No.	10 179	3 603	5 187	252	1 389	6 828	--
		Wt. (kg)	36 645	12 972	18 673	908	5 000	24 581	53.0
	1973	No.	8 959	3 726	3 994	261	1 239	5 494	--
		Wt.	30 636	12 747	13 652	892	4 237	18 781	43.9
Great Bear Lodge (Neiland Bay and Bear Island)	1971	No.	7 780	5 835	1 066	408	879	2 353	--
		Wt.	27 931	20 948	3 828	1 465	3 155	8 448	28.5
	1972	No.	9 787	7 840	811	549	1 120	2 496	--
		Wt.	45 769	36 615	3 864	2 563	5 290	11 717	34.5
	1973	No.	8 153	6 302	909	441	942	2 292	--
		Wt.	39 950	30 881	4 453	2 161	4 616	11 230	35.7
	1974	No.	--	--	150	518	1 089	1 757	--
		Wt.	--	--	1 498	2 466	6 926	10 890	30.1
	1979	No.	4 597	3 840	275	269	482	1 026	4.8
		Wt.	22 295	18 625	1 332	1 303	2 338	4 976	23.1
Branson's Cameron Bay Lodge	1971	No.	6 380	3 145	2 464	220	771	3 455	--
		Wt.	21 947	10 819	8 476	757	2 652	11 885	46.3
	1972	No.	6 622	3 212	2 708	225	702	3 635	--
		Wt.	18 611	9 026	7 612	632	1 973	10 217	43.7
	1973	No.	6 188	2 658	2 975	186	555	3 716	--
		Wt.	17 141	7 363	8 241	515	1 537	10 293	56.6
	1974	No.	13 311	10 052	2 182	704	1 077	3 963	--
		Wt.	43 309	32 709	7 100	2 290	3 500	12 890	49.8
Great Bear Trophy	1972	No.	--	--	--	--	--	3 709	--
		Wt.	--	--	--	--	--	12 277	51.4
	1973	No.	8 236	4 618	2 739	232	879	3 850	--
		Wt.	27 261	15 285	9 967	1 070	2 909	13 046	54.4
	1976	No.	6 049	3 535	1 479	247	1 032	2 758	--
		Wt.	20 018	11 704	4 897	818	3 417	9 132	29.0
	1980	No.	10 710	8 962	778	749	970	2 497	7.54
		Wt.	26 132	21 867	1 898	1 827	2 367	6 092	18.40
Arctic Circle	1972	No.	5 386	4 196	854	294	336	1 484	--
		Wt.	13 668	10 490	2 325	734	853	3 912	34.9
	1975	No.	9 425	7 634	1 319	534	472	2 325	--
		Wt.	26 419	21 399	3 697	1 497	1 323	6 517	55.9

Table 9. Lake trout catch rates from departmental creel studies on Great Bear lake, 1973-1980 (catch in numbers)

Lodge/year	1973		1974		1975		1976		1979		1980	
	/day	/hour	/day	/hour	day	/hour	/day	/hour	/day	/hour	/day	/hour
Arctic Circle	--	--	--	--	10.9	1.75	--	--	--	--	--	--
Branson's	4.51	0.75	5.20	0.93	--	--	--	--	--	--	--	--
Great Bear	5.17	0.66	--	--	--	--	--	--	3.83	0.78	--	--
Great Bear Lake	3.68	0.74	--	--	--	--	--	--	--	--	--	--
Great Bear Trophy	4.49	0.83	--	--	--	--	3.1	0.65	--	--	5.40	1.23

Table 10. Licence revenues for Great Bear Lake lodges and Fort Franklin Vendor for 1975-1982

Year/Category	Resident	Non-Resident	Total
1982	$2 245	$13 320	$15 565
1981	1 760	12 375	14 135
1980	1 170	12 080	13 250
1979	1 125	9 770	10 895
1978	1 152	12 020	13 172
1977	1 110	13 880	14 990
1976	729	10 972	11 701
1975	680	10 223	10 904

Table 11. Direct employment in fishing lodges on Great Bear Lake for the period 1978-1982

Lodge/Year	1978	1979	1980	1981	1982	X
Arctic Circle	41[a]	41	41	41	41	41
Branson's Lodge	45[a]	45	45	45	45	45
Great Bear Lake	58	60	60	62	61	60
Great Bear	46	43	36	39	38	40
Great Bear Trophy	38[a]	38	38	38	38	38
Total	228	227	220	225	223	225

[a]Average employment over the five year period rather than year-by-year employment pattern.

Table 12. Great Bear Lake commercial fishery: pro forma statement.

Item	$ Amount
Gross Sales	$30 375
Sales Adjustments	
sales transportation	11 615
sales allowances	456
subtotal	12 071
Plant Operating Costs	
variable packing	2 430
fixed operating	4 850
subtotal	7 280
Plant Amortized Investment	16 275
Plant Net Cash Flow	-13 188
Harvest Operating Costs	
variable harvest	26 451
fixed operating	3 675
subtotal	27 126
Harvest Amortized Investment	5 696
NET CASH FLOW HARVESTING	-41 072

Table 13. Sensitivity analysis of volume changes for fresh sales for Great Bear Lake commercial fishery development proposal.

Volume input	Revenues	Costs	Net cash flow
6 804 kg.	$ 15 188	$ 53 279	$-38 091
13 608	30 375	65 930	-35 555
20 412	45 563	78 168	-32 605
27 216	60 750	90 649	-29 899
34 020	75 938	109 375	-33 437
40 824	91 125	128 296	-37 171
47 628	106 313	152 740	-46 427
58 968	131 625	190 948	-59 323
65 772	146 813	206 053	-59 240
75 576	162 000	229 954	-67 954

Table 14. Sensitivity analysis of volume changes for frozen sales for Great Bear Lake Commercial fishery development proposal.

Volume input	Revenues	Costs	Net cash flow
6 804 kg.	$ 15 188	$ 67 112	$-51 924
13 608	30 375	79 763	-49 388
20 412	45 563	92 002	-47 439
27 216	60 750	104 482	-43 732
34 020	66 825	121 857	-55 032
40 824	73 629	138 221	-64 592
47 628	79 947	160 224	-80 277
58 968	90 558	193 635	-103 077
65 772	96 309	202 685	-106 376
75 576	102 384	223 453	-121 069

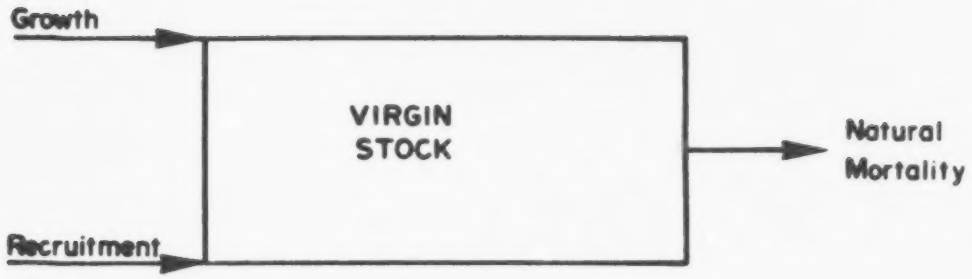

Fig. 1. Natural equilibrium of an unexploited fish stock.

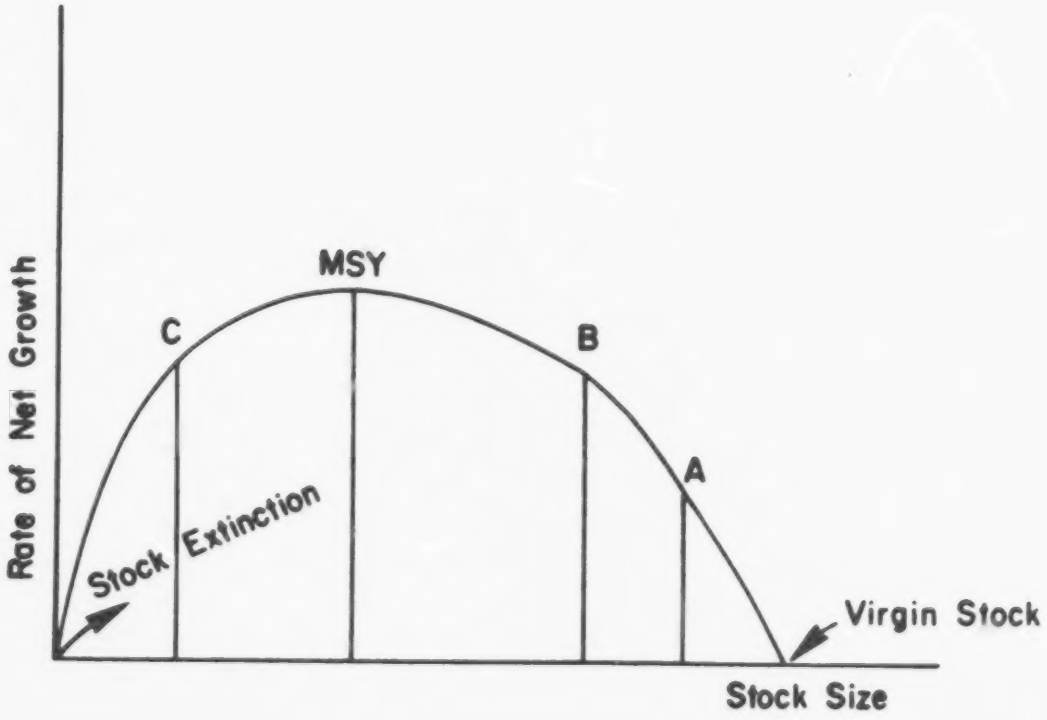

Fig. 2. Rate of net growth of an exploited fish stock.

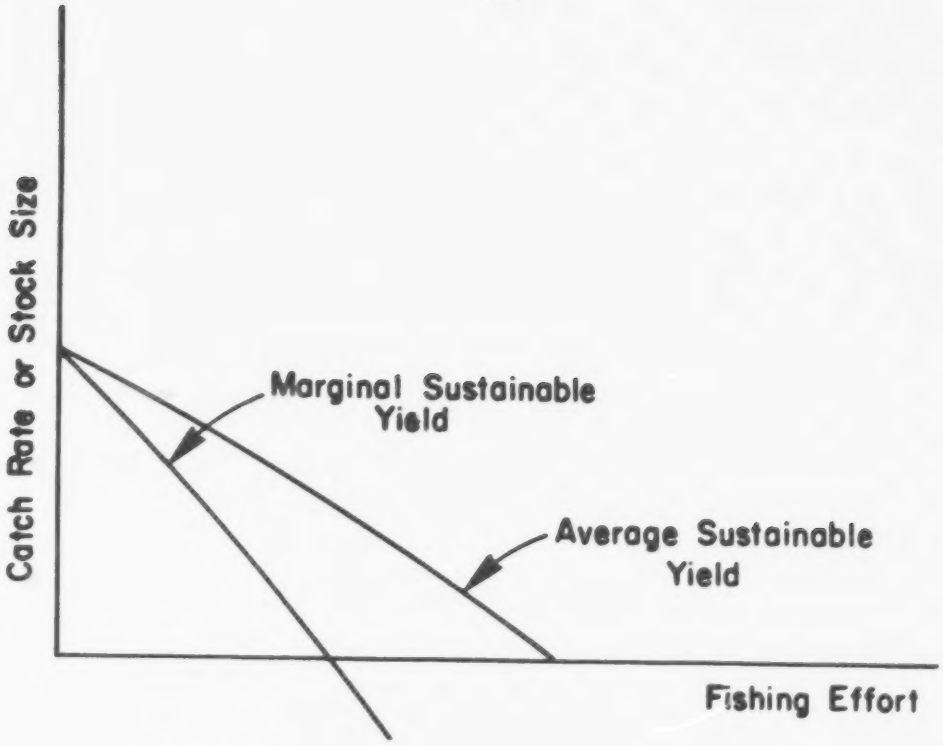

Fig. 3. Average and marginal sustainable yields in a fishery.

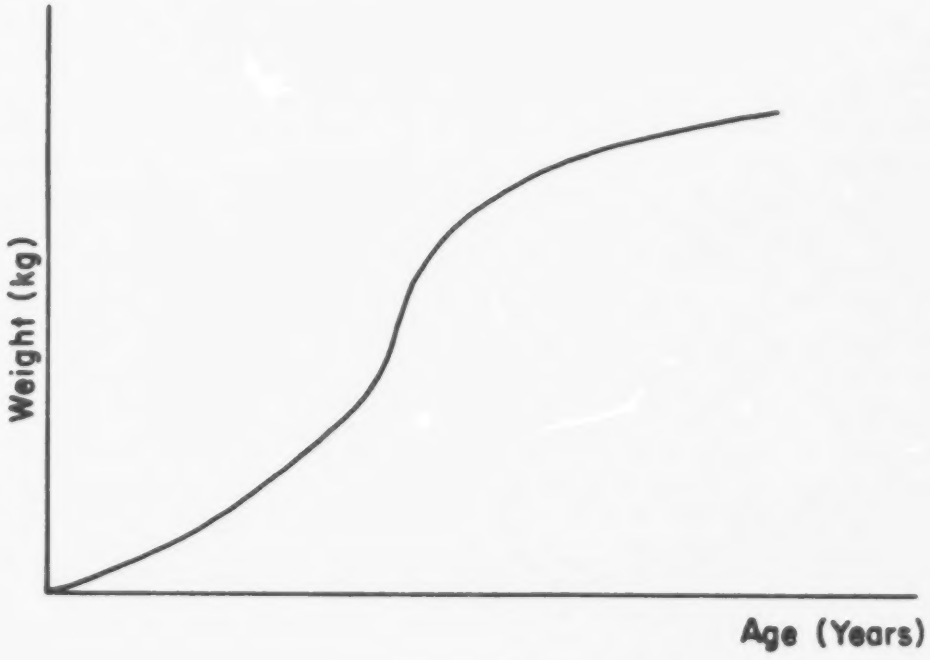

Fig. 4. Growth curve for individual fish.

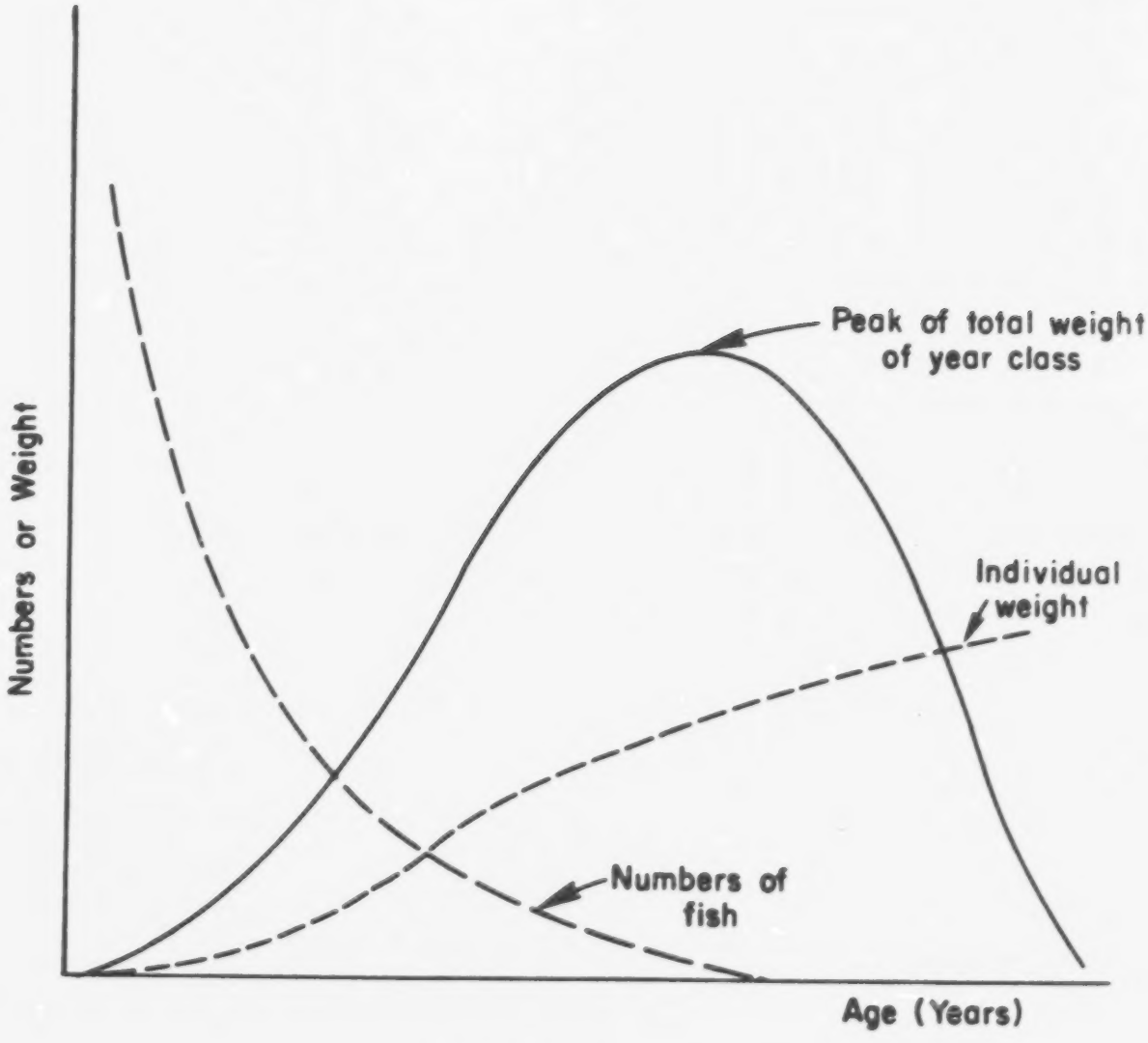

Fig. 5. Growth curves for year classes of fish stock.

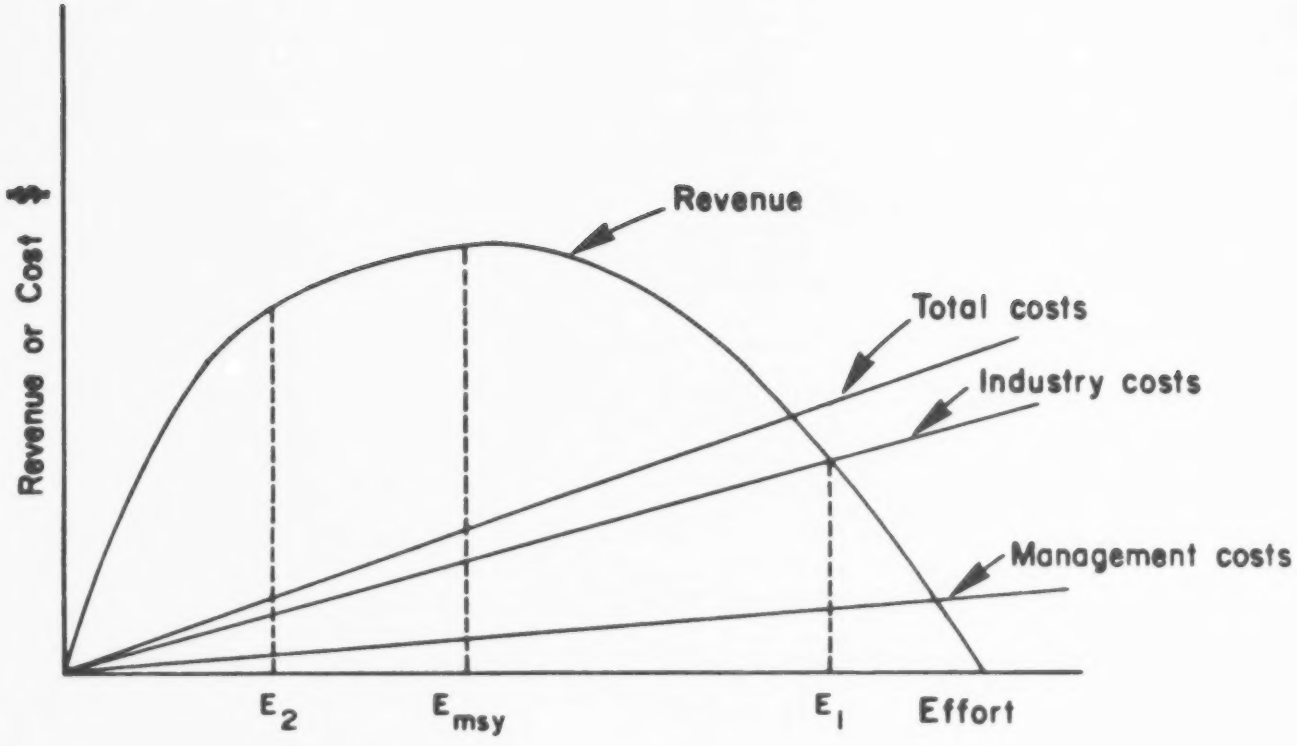

Fig. 6. Economic model of commercial fishing.

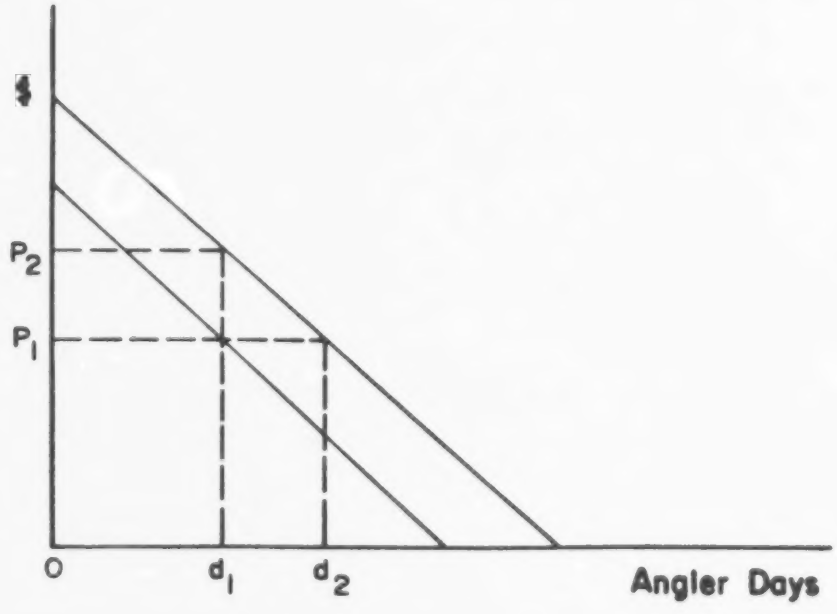

Fig. 7. Economic demand for sport fishing.

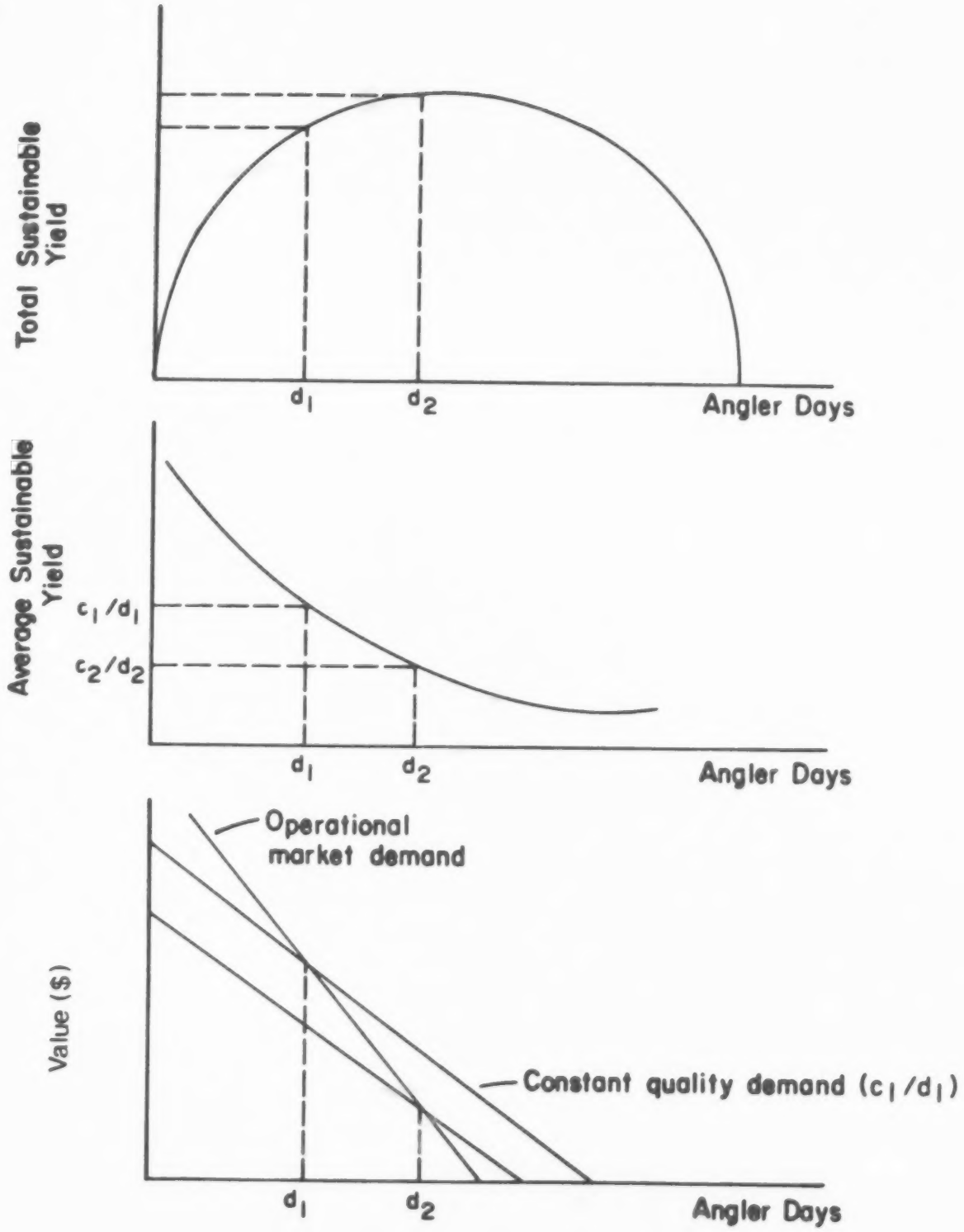

Fig. 8. Bio-economic model of a sport fishery.

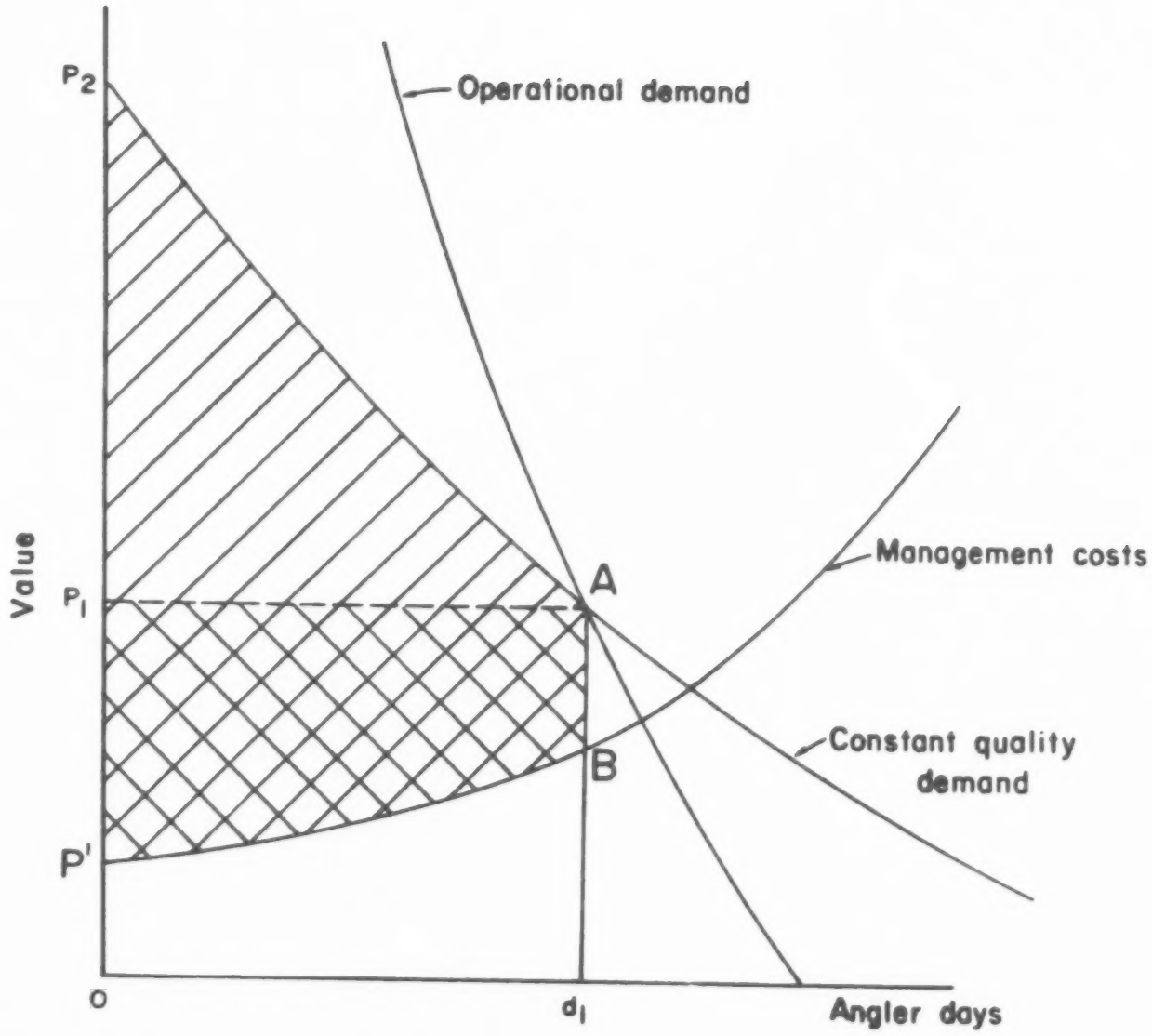

Fig. 9. Net economic value of the sport fishery.

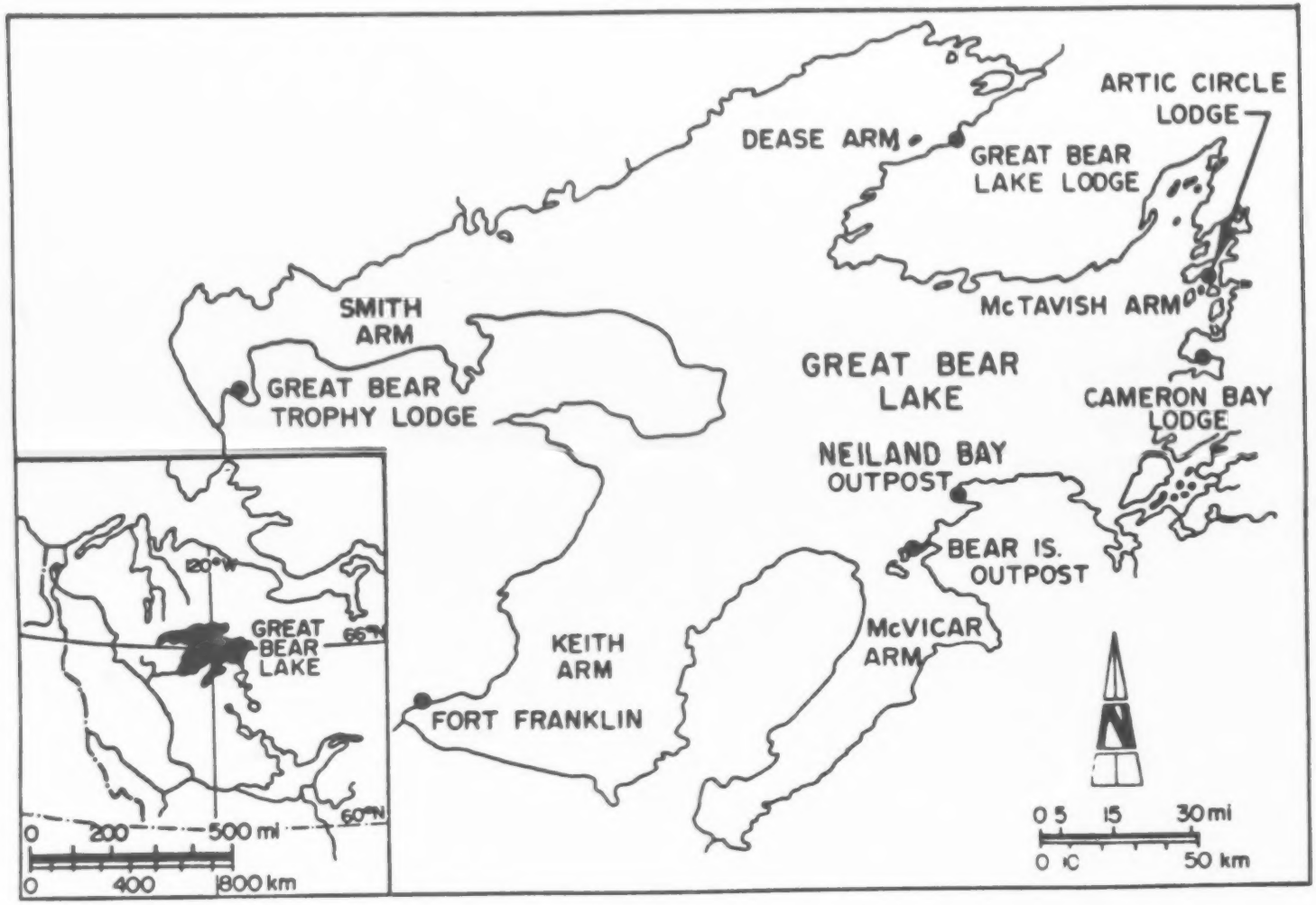

Fig. 10. Location of Great Bear Lake

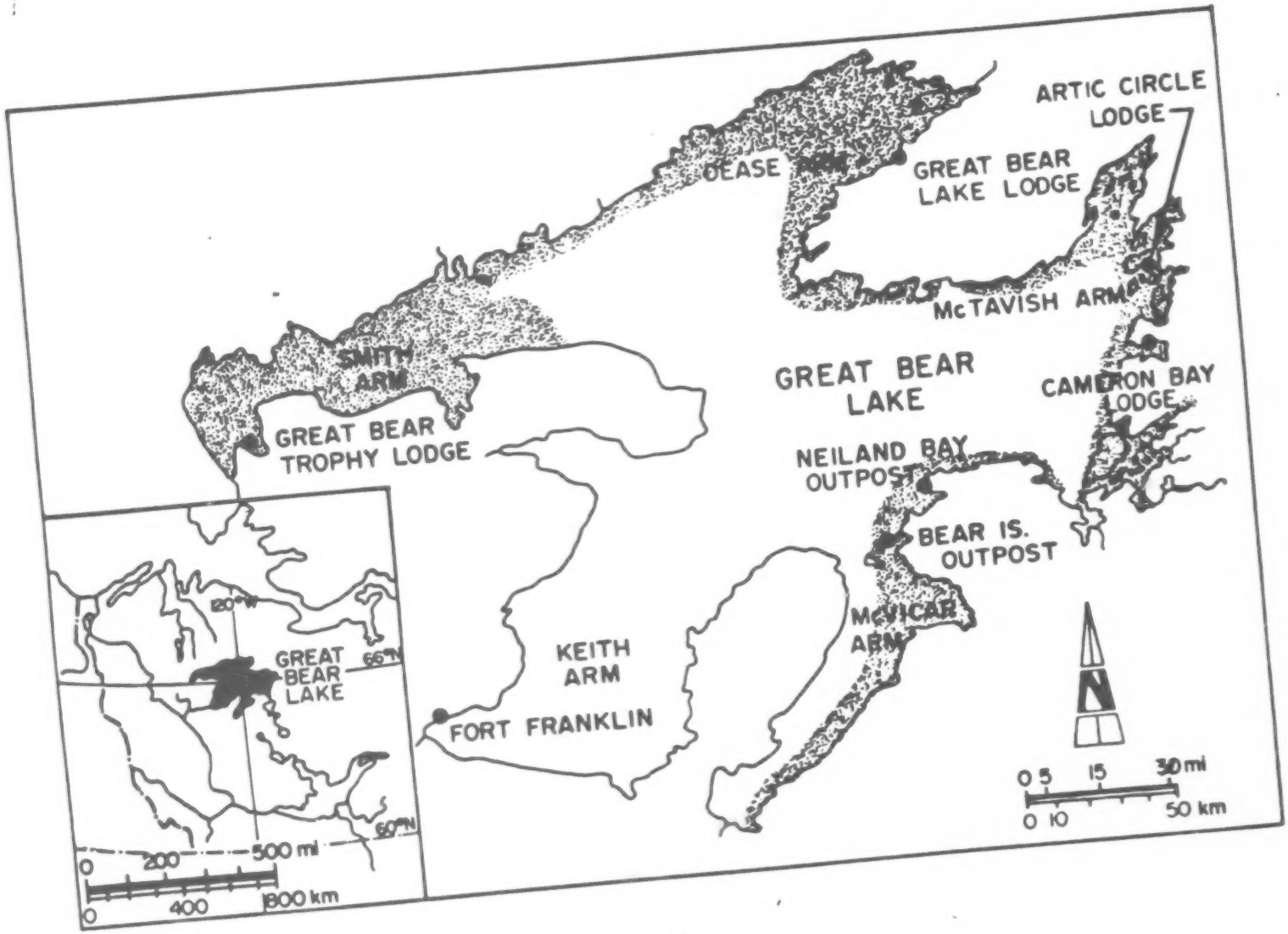

Fig. 11. Areas used for lodge-access sport fishing.

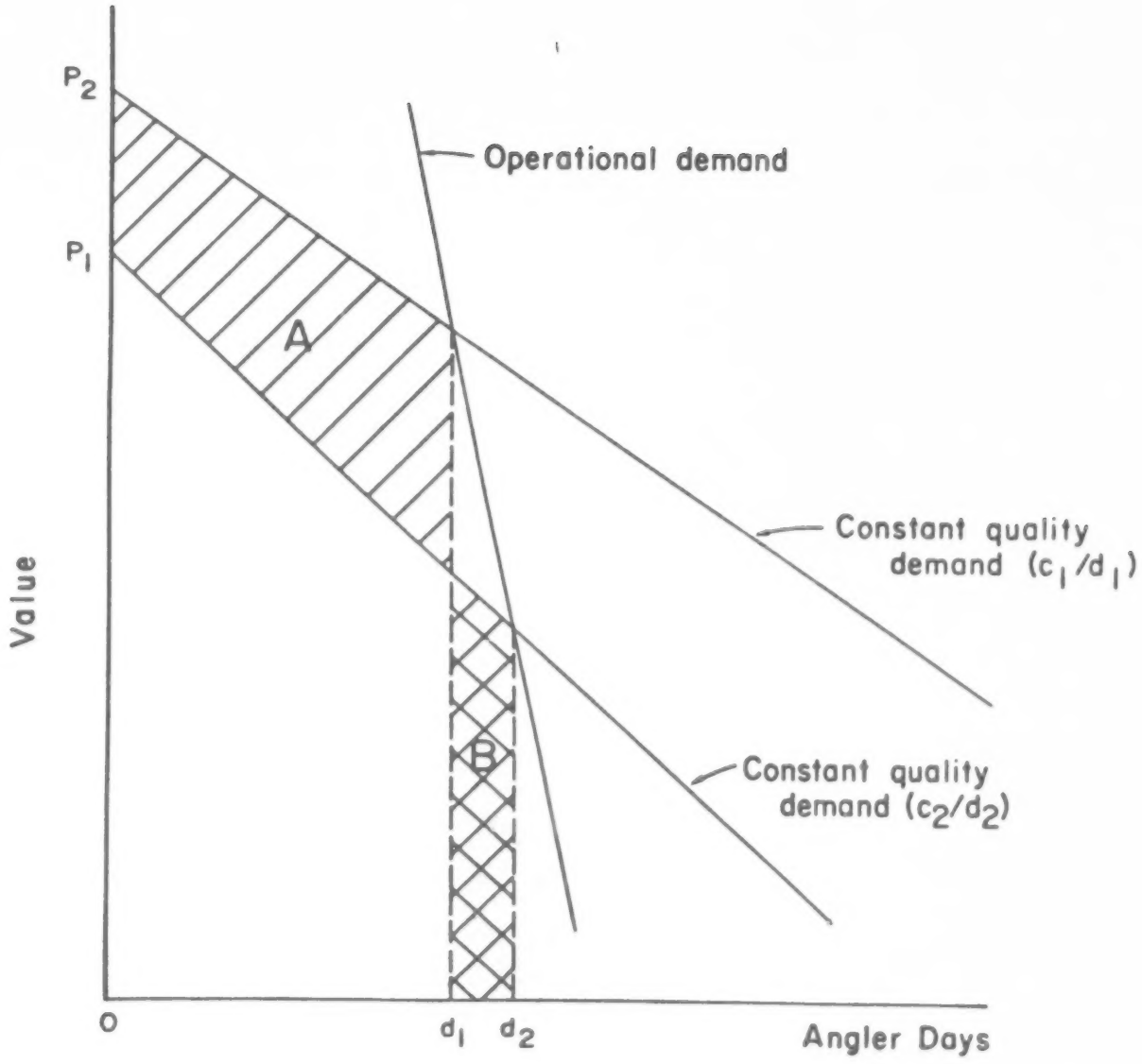

Fig. 12. Effect of bag limits on economic values in the sport fishery.

Appendix 3

Community of Fort Franklin
Response to Interim Report

BOREAL ECOLOGY

April 22, 1985

Mr. Dan Topolinski,
Regional Economic and Marketing
Services,
Department of Fisheries & Oceans,
501 University Crescent,
Winnipeg, Manitoba.
R3T 2N6

Dear Mr. Topolinski,

This is further to our recent telephone conversation regarding the development of a resource management plan for Great Bear Lake. The draft position paper dated February 1985 is the community's initial response to the working group's paper of April 1984. We look forward to receiving the working group's response and working with you to establish a resource management plan that ensures the long term sustainability of Great Bear Lake.

Yours truly,

Benjamin A. Hubert

cc. Walter Bayha

Boreal Ecology Services Ltd., Box 277, Yellowknife, N.W.T. X1A 2N2 Tel. (403) 873-5847/[illegible]

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FISH MANAGEMENT IN GREAT BEAR LAKE

Submitted to:
Fort Franklin Dene Band Council

By:
Boreal Ecology Services Ltd.,
Yellowknife, N.W.T.

February 18, 1985

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FISH MANAGEMENT IN GREAT BEAR LAKE

INTRODUCTION

The Satudene have lived along the shores of Great Bear Lake since time immemorial. During their entire period of occupation of these lands the Satudene have harvested fish from Great Bear Lake and its tributaries.

The pattern of land use by the Satudene of Great Bear Lake and the adjacent lands can be shown by the trading posts that have operated there in the last 150 years. The first post to be established on Great Bear Lake is now the site of the community of Fort Franklin. It is named after Sir John Franklin who used a former Northwest Company post as headquarters for his expedition of geographical exploration from 1825 - 1827. It was taken over by the Hudson's Bay Company who operated it intermittently to the early 1900's. Trading posts were also established at Cameron Bay - now the location of Branson's Lodge, Port Radium, Hornby Bay, Dease Bay, and Good Hope Bay (Figure 1). These sites attest to the widespread distribution of the Satudene in their aboriginal pursuits during the past 150 years. Fort Franklin took on a semblance of a permanent settlement in 1949-50 when a catholic mission, federal day school and permanent Hudson's Bay post were established. The community has grown steadily from these meagre beginnings as follows:

1961	-	238	population
1966	-	311	
1971	-	339	
1976	-	422	
1981	-	521	

In recent years many of the former camps have been reoccupied for the purposes of hunting, trapping and fishing. See Figure 2

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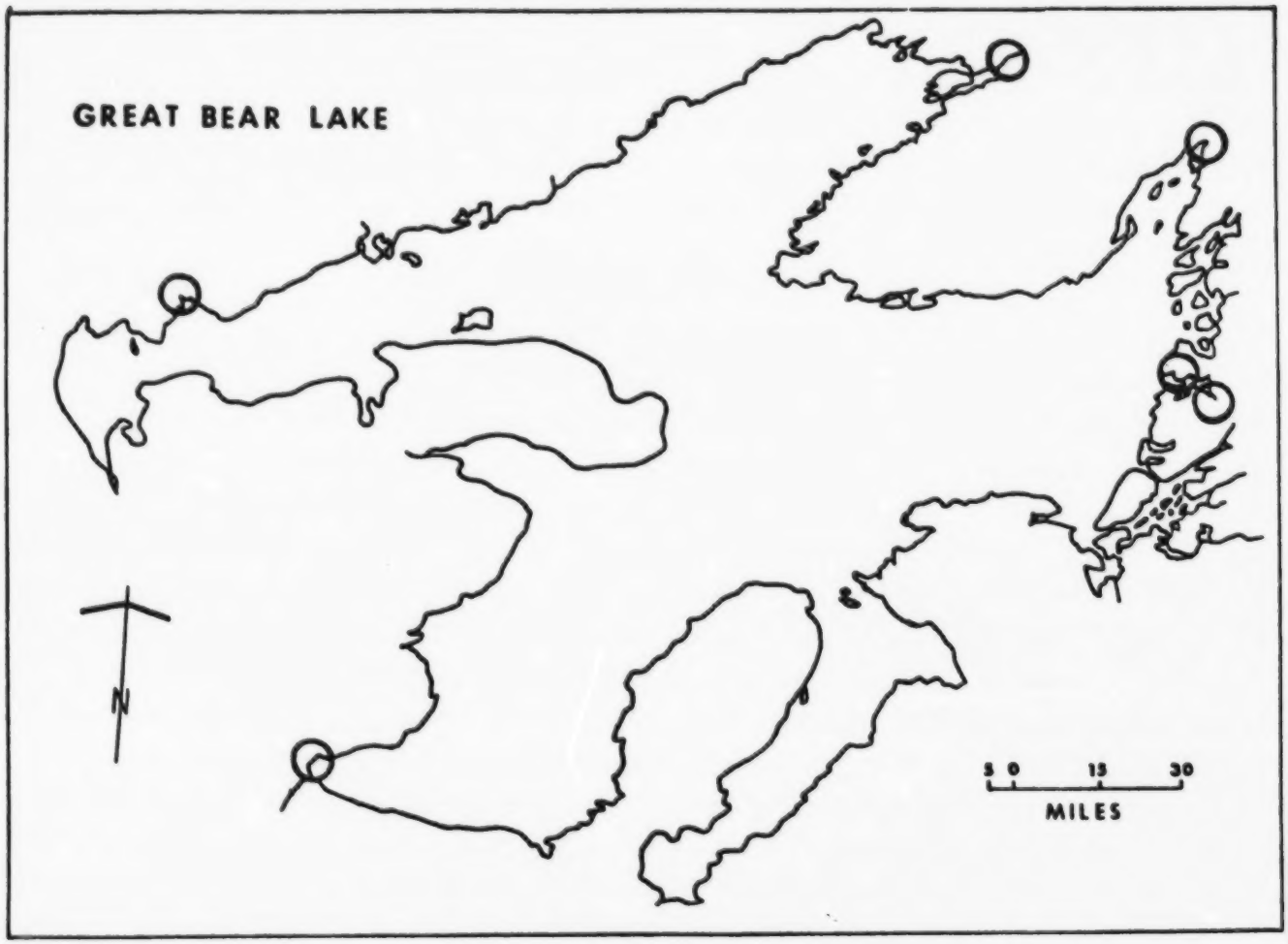
Figure 1. Early Trading Posts Located on Great Bear Lake



Source: Fur Trade Posts of the Northwest Territories 1870-1970, by Peter J. Usher. 1971. INAC. Northern Science Research Group.

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HISTORICAL SKETCH OF GREAT BEAR LAKE FISHING LODGES

The first fishing lodge to be on Great Bear Lake was established in the 1950's and was operated by several American medical doctors at Sawmill Bay. This lodge currently operates under the name of Great Bear Lodge. Facilities at Sawmill Bay are used as a staging point to service camps at Bear Island and Neiland Bay. Plummer's Great Bear Lake Lodge originally started in Conjuror Bay in 1961. Apparently overfishing ruined the trophy fishery there and the lodge was relocated to the present location on the Dease Arm in 1968.

Branson's Lodge, formerly known as Cameron Bay Lodge operates from the former townsite at Cameron Bay. It was established as a fishing lodge in 1962 and has operated ever since. Since 1973 Branson's Lodge has operated an outcamp at Katseyedie River on the North Shore of Great Bear Lake.

Arctic Circle Lodge was established in 1965 but has changed ownership and management several times. It has operated continuously since 1975. Arctic Circle Lodge also operates from two outcamps at Takaatcho River and Appleby Point in Hornby Bay both in McTavish Arm.

Great Bear Trophy Lodge was established in Ford Bay of Smith Arm in 1969. It also operates an outcamp at Good Hope Bay across Smith Arm from the base lodge.

Appendix 2 gives dates and places of lodges' land leases on Great Bear Lake.

The Commissioner of the Northwest Territories placed a lid on lodge expansion on Great Bear Lake in 1970. On concerns for the

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for locations of active outpost cabins occupied by Satudene from Fort Franklin. Appendix 1 provides a summary of trading posts operating on Great Bear Lake from 1870 to 1970.

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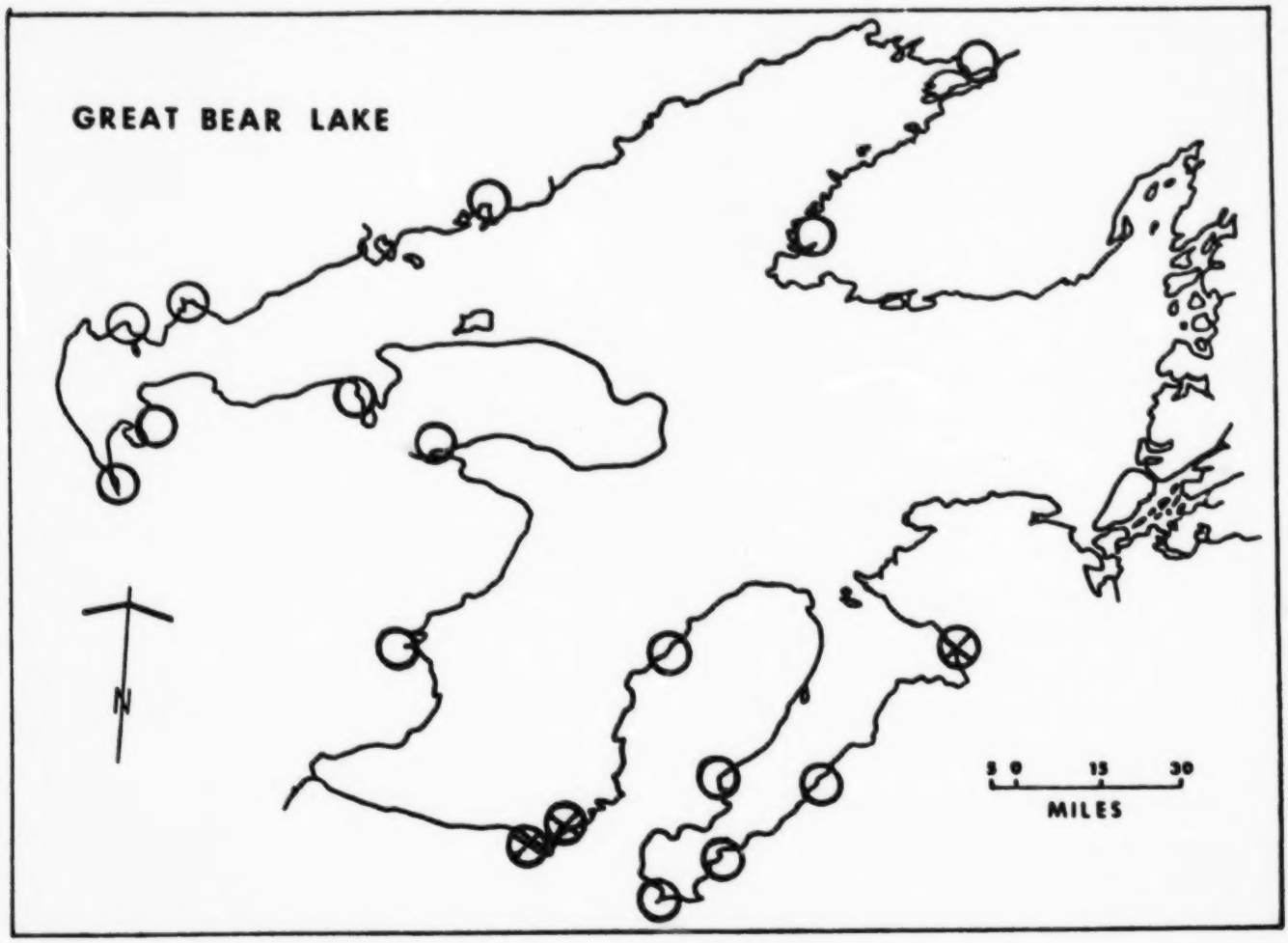
Figure 2. Active Outpost Cabins Occupied by Satudene



(X) Cabins in disrepair, slated for reconstruction.

long term impact of sport fishing on Great Bear Lake expressed by the residents of Fort Franklin, the then Commissioner Mr. Stuart Hodgson undertook to place a ceiling on lodge expansion through Travel Development Area Regulations. These regulations were first introduced under the Travel and Outdoor Recreation Ordinance, now the Travel and Tourism Ordinance, in 1970. Under the Travel and Tourism Ordinance the Government of the Northwest Territories Department of Economic Development and Tourism issues licences to Tourist Establishments and in the case of fishing lodges on Great Bear Lake specifies the number of guest beds that the lodge may provide.

There are many former guides in Fort Franklin who remember the early days of the lodge access to trophy fishing on Great Bear Lake. There appear not to have been any limits on catch and possession. One former guide said "two tubs a day was no big deal for a fisherman". There is a strong feeling in the community that instead of expanding the area of fishing by lodge based fishermen - the fishery should be shut down for a period. Local fishermen - former guides - say that within 5 years of Plummer's leaving their original site the fishing there had improved a great deal. The community's experience with commercial walleye fishing on Lac Ste. Therese reinforces the belief that shutting a fishery down for a period could bring significant improvements in years to come.

Former guides in Franklin who expressed concern for the future of the fishery during this unregulated period have a strong feeling that they jeopardized future employment prospects as guides by stating their feelings at the time.

Unfortunately, this process does not regulate the number of fishermen that are serviced by a lodge. For example - if a lodge has 50 guest beds and operates for 8-9 weeks as is the case with

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most of the Great Bear Lake lodges a fully booked season will have a maximum of 3150 guest days (9 weeks x 7 days x 50 beds) at the lodge. If each guest stays 5 days the lodge can cater to 630 fishermen. If each guest stays 10 days the lodge can cater to 315 fishermen. Since each fisherman can remove fish from Great Bear Lake, the difference between a 10 day schedule and a 5 day schedule for a 50 bed lodge is 630 fish removed from the lake under a 2 fish possession law. This example shows that it may be difficult to regulate trophy fishing pressure by specifying lodge bed capacity and fish possession limits only. The bed capacity does not limit the number of fishermen on the lake.

Lodges and their bed capacities for Great Bear Lake are:

Great Bear Lodge	34 beds plus 20 beds at Bear Island Outpost
Plummer's Great Bear Lake Lodge	54 beds
Branson's Cameron Bay Lodge	40 beds
Arctic Circle Lodge	34 beds
Great Bear Trophy Lodge	40 beds
Sah Tew Lodge	4 beds

These bed capacities have not changed in the last several years. Unfortunately there has been no systematic program of data collection on the number of guests per lodge per year and the number of fish they have taken. The only record available to the resource manager - DFO - is the number of licences sold by the lodge operators. This record however does not include the fisherman who purchased fishing licences elsewhere but fish on Great Bear Lake using the facilities on Great Bear Lake provided by lodges or perhaps others.

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Current Management Processes

The resource manager, the Department of Fisheries and Oceans has monitored the lodges on a rotating basis as part of a creel census program. This program began in 1972. The report on the first summer's creel census concluded that "the overall size and availability of trophy lake trout is declining due to the nature and magnitude of the present fishing harvest". The recommendations of that report (Falk, Gilman and Dahlke, 1973*) included the following:

> "Recommendations for the changing and future direction of the Fisheries Service programs in the Great Bear and Great Slave area are as follows:
>
> 1. The 1972 field program be continued and enlarged to include all lodges presently on the lakes.
>
> 2. A program be established to determine the effect of barbed and barbless hooks on the mortality rate among released lake trout.
>
> 3. A survey utilizing tagging methods be conducted to collect additional information on the movements and life history of lake trout within Great Bear and Great Slave Lakes.
>
> 4. A study be conducted to estimate the fecundity as well as spawning locations and cycles of lake trout within Great Bear and Great Slave Lakes.
>
> 5. A direct effort be made to educate anglers and lodge operators utilizing Great Bear and Great Slave Lakes on the inherent conservation problems.
>
> The ultimate aim of these recommendations is to provide a method of preserving the unique fisheries of Great Bear and Great Slave Lakes for future utilization. As good sports fishing becomes rarer and numbers of fishermen increase, Great Bear and Great Slave Lakes' appeal of unmarred wilderness and trophy fishing will become increasingly valuable, both aesthetically and economically."

*Excerpt from: The 1972 Sports Fisheries of Great Bear and Great Slave Lakes, Northwest Territories by M.R. Falk, D.V. Gillman and

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L.W. Dahlke. 1973. Environment Canada, Fisheries and Marine Service. Technical Report Series No. CEN/T-73-8.

Despite these recommendations the creel census program was reduced to a rotating census. Table 1 shows the years for which creel data are available for a particular lodge.

The rotating creel census program began in 1972 reported 13 out of 78 possible data sets. Unfortunately the data reported do not indicate which if any of the results pertain to outcamps operated by the lodge in question.

Table 1. Time, Place and Reports of Creel Census Efforts on Great Bear Lake, N.W.T.

Lodge	Years for which Creel Census is Reported					
Great Bear Trophy Lodge	1972[1]	1973[3]		1976[5]	1980[7]	
Great Bear Lake Lodge	1972*	1973				
Arctic Circle Lodge	1972		1975[5]			
Branson's Cameron Bay Lodge	1972		1974[4]			
Great Bear Lodge	1972[2]	1973[2]			1979[6]	

1 1972 results reported by Falk et al 1973.
2 Neiland Bay only.
3 1973 results reported by Falk et al 1974.
4 1974 results reported by Falk et al 1975 and Moshenko and Gilman 1978.
5 1975 and 1976 results reported by Moshenko and Gilman 1978.
6 1979 results reported by Falk et al 1982.
7 1980 results reported by Gilman and Roberge 1982.
* No creel census done. Data volunteered by operators.
Note: no creel census results have been published for 1981-1984.

The decline in trophy sized lake trout noted in the first creel survey of 1972 and the recommendations made on monitoring the catch has not resulted in improved data collected, however angler catch and possession limits were reduced from 3 and 5 to 2 and 2 in 1979

for implementation that year. Under the regulations only 1 of the 2 fish can be larger than 28 inches in length.

At the meeting of Great Bear Lake lodge operators, attended by the community's consultant in Fort Smith N.W.T. on 21 November 1984, R. Moshenko of DFO suggested that the downward trend in size of fish caught on Great Bear Lake was levelling off in response to these restrictions. Unfortunately lodge and area specific data are not available for illustration to community leaders.

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A MANAGEMENT PROPOSAL

The community of Fort Franklin is familiar with the issues discussed in the paper prepared by the Great Bear Lake working group; it has observed the lodge based fishery grow and expand over the past 25 years. It is also aware of the impact that a commercial net fishery could have on fish stocks in Great Bear Lake. Also under current economic market conditions an export market for Great Bear Lake whitefish may not be economically viable. The community therefore proposes a 10 year management program based on objectives and procedures enumerated below.

Objectives of a Great Bear Lake Fisheries Management Plan

1. To provide for the subsistence and domestic fish requirements for the community of Fort Franklin and the camps occupied by the Satudene of Great Bear Lake.

2. To provide for small selective commercial fisheries at outpost camps on Great Bear Lake to meet any local and regional markets which may develop.

3. To maintain a trophy angling fishery in preference to any commercial gill net fishery for export and manage the trophy angling fishery for the long term sustainability of trophy sized lake trout stocks.

4. To implement a ten year conservation and management program that achieves these objectives and provides a better understanding of the resources of Great Bear Lake and their long term potential.

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The community feels that the effective conservation and management of the fish stocks can be achieved through the implementation of specific procedures. The procedures and their rationale follow.

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MANAGEMENT PLAN IMPLEMENTATION PROCEDURES

Distribution of Anglers

Position

1. That the angling activity of the 5 lodges currently operating be restricted to McTavish Arm, Smith Arm and Dease Arm (see Figure 3 for map of restricted areas of Keith Arm and McVicar Arm) and that no lodge based fishing take place within 10 miles of existing Satudene camps and cabins.

2. That the angling distribution pattern of the 5 lodges currently operating be returned to that of 1970. Figures 4 and 5 show the expansion of lodge based angling activity between 1972 and 1982.

Rationale

These two recommendations go to the heart of the policy established in 1970 which put a hold on further lodge development on the lake. In the community's view, that policy has not been kept in that additional outposts on the lake have the same effect as a new lodge. Furthermore, flying day fishermen into Deerpass Bay and taking anglers to Preble Bay by boat are an outright violation of the policy that claimed to reserve the Keith Arm for the community of Fort Franklin. Also flying fishermen to the area around the mouth of the Johnny Hoe River and providing shelter and boats for fishermen in Good Hope Bay is viewed as serious encroachment into traditional harvesting areas as well as violation to the spirit of the 1970 policy.

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Figure 3. Great Bear Lake showing the area of Keith and McVicar Arms proposed to be reserved for fishing activities of the Fort Franklin residents.

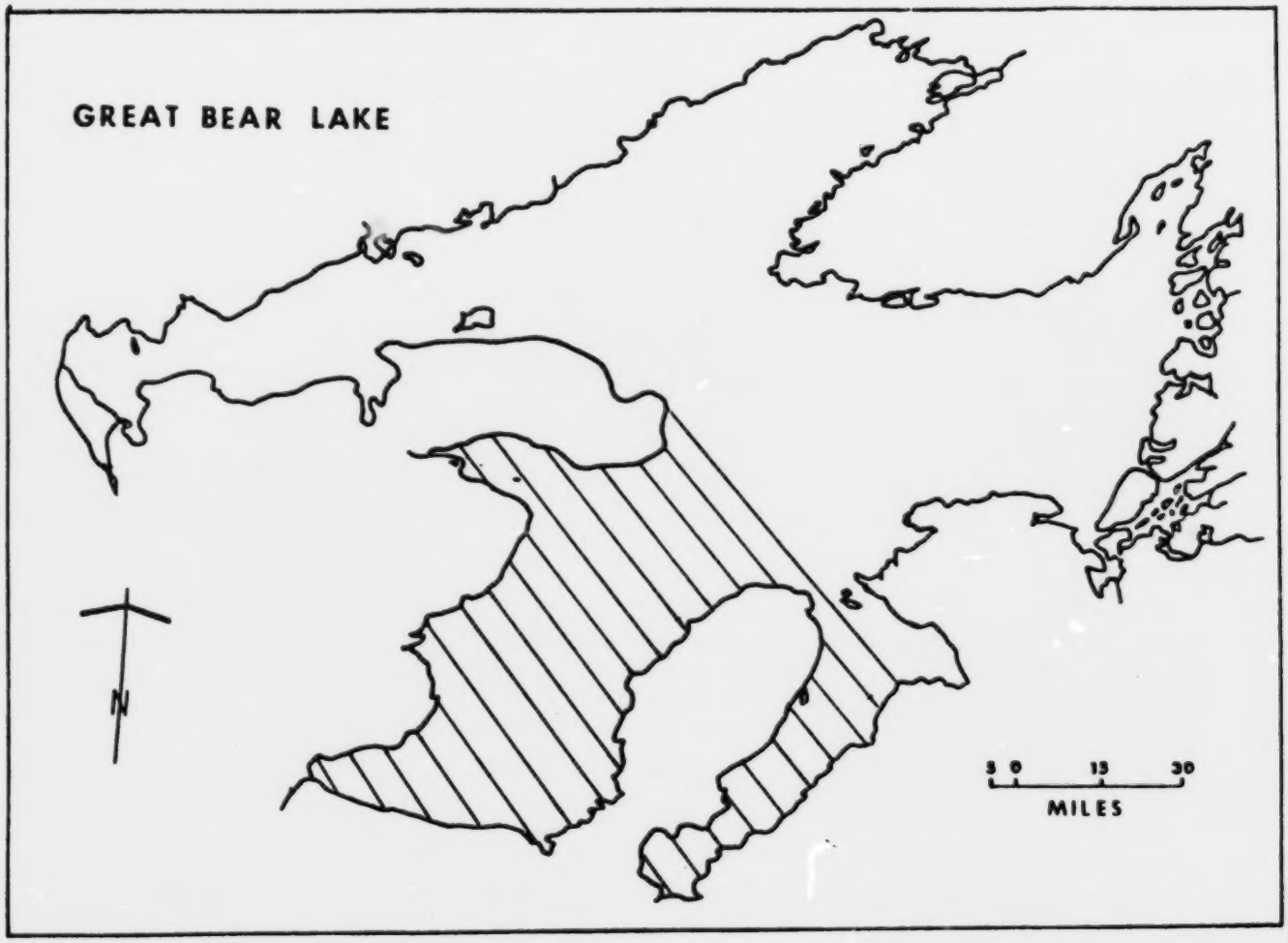

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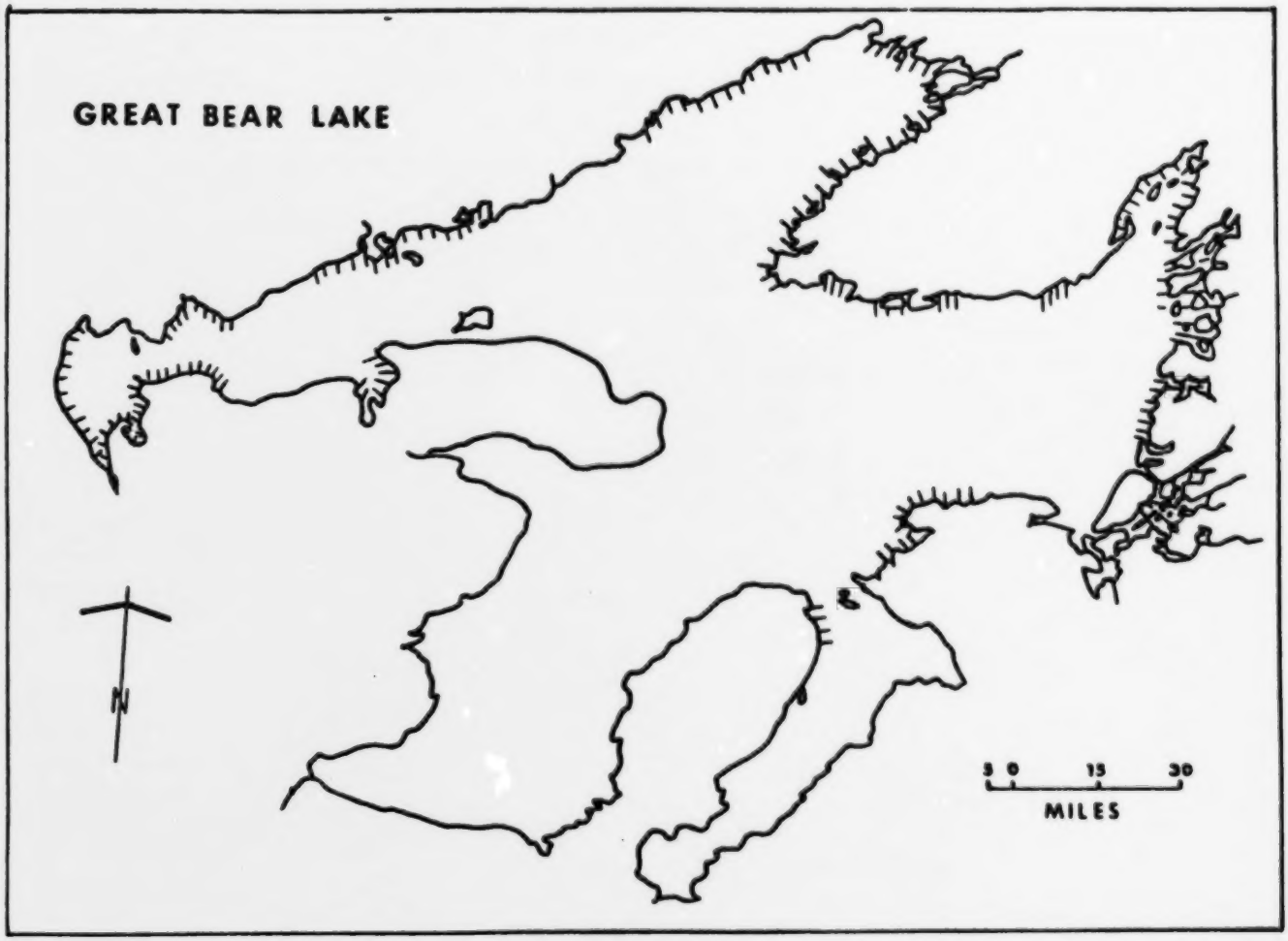
Figure 4. Map of Great Bear Lake Showing Areas Fished in 1972



Source: Department of Fisheries and Oceans.

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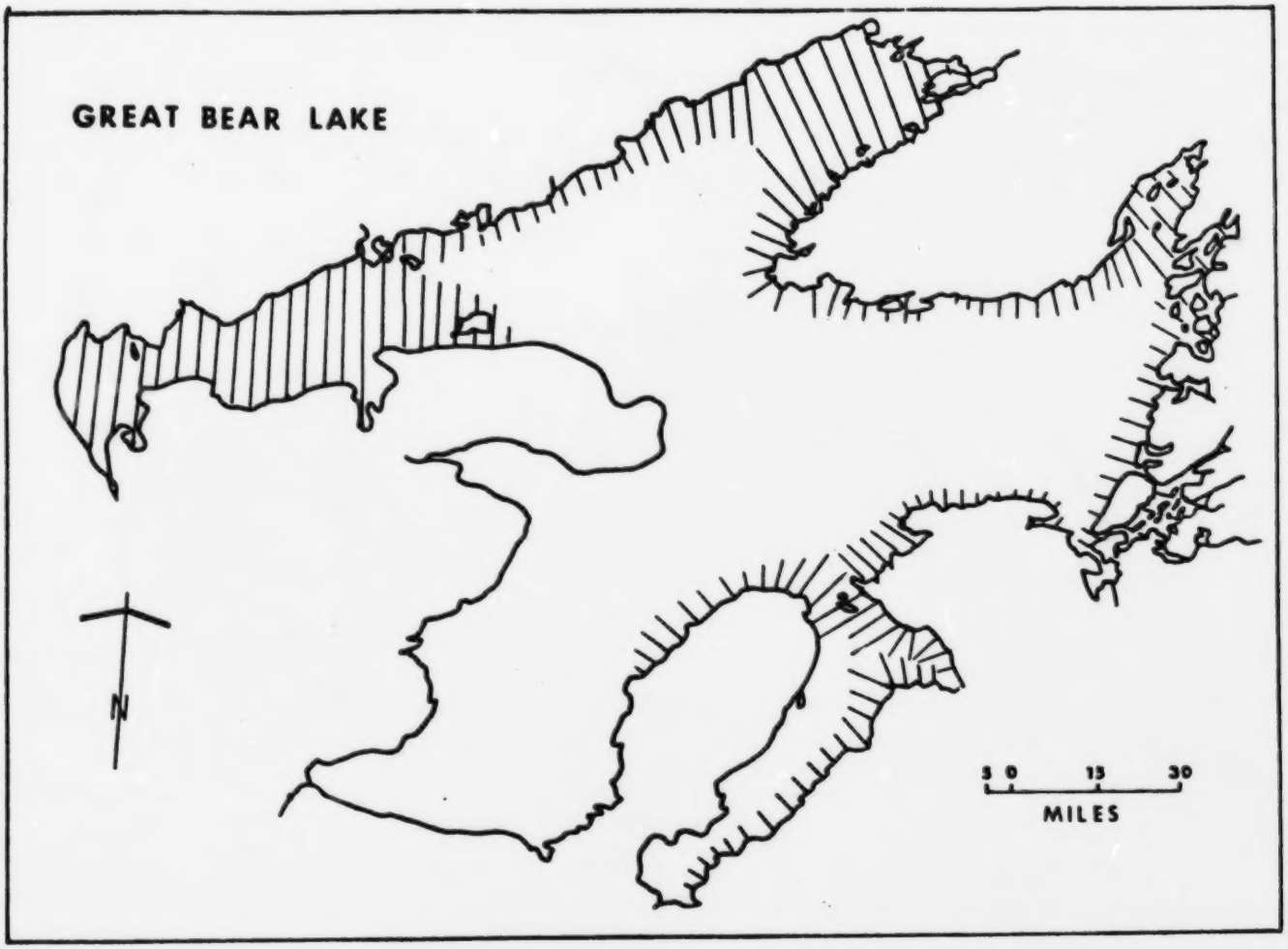
Figure 5. Map of Great Bear Lake Showing Areas Fished in 1982



Source: Department of Fisheries & Oceans.

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The return to 1970 angling distribution activity should pose no difficulty on the lodges if the allocation of beds is compatible with the capacity of the stock to absorb current fishing pressure. The bed capacity was assigned prior to the current catch and possession limits which according to Mr. R. Moshenko have stabilized the downward trend in fish stocks.

Monitoring the Fishery

Position

3. The management plan shall be monitored by a committee representing:

    the Satudene,
    the Federal Government, and
    the Government of the Northwest Territories.

4. Each lodge should prepare a daily distribution map of its angling activities and angling intensity on Great Bear Lake and report the vital statistics on all fish landings, releases, shore lunches, and fish removed to the lodge.

5. At the end of the season each lodge shall provide the committee with a certified correct copy of its guest book indicating, by providing their angling licence number, which guests were anglers and which were not. The lodge should not provide any equipment for fishing to any guest without first recording that person as a guest and his/her angling licence.

Rationale

The data available on the last 15 years of lodge based angling

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is insufficient to draw conclusions on the impact of angling on lake trout stocks in Great Bear Lake. It is known for example that one of the first lodges established on Great Bear Lake relocated to an unharvested area within 10 years. There are no data on fishing intensity, landings, size, or weight by which to assess the fish stock response to angling nor the response in the post angling period. Former guides recall that in the final years of Plummer's original lodge the only way you could sure of catching a fish was to set a net.

A creel census program begun in 1972 has produced only 13 out of a possible 78 data sets - all reported in isolation rather than into a cumulative and integrated analyses.

The relocation of a lodge and the proliferation of day fishing by aircraft and outpost camp leads to the hypothesis that the angling pressure of the lodges' existing capacity exceeds the trophy fish stocks in the area accessible to the lodges. Unfortunately the data with which to test the hypothesis, under either old or new catch and possession regulations, are inadequate to show to the community leaders that the trophy fish stocks in Great Bear Lake are being managed to protect the long term options of the community. The formation of a committee which will annually receive data and disseminate results should overcome the lack of communication that has plagued all parties in the past.

Angling intensity should include the number of hours fished. Former guides speak of taking the "night shift" to accommodate fishermen who wish to fish 12-15 hours per day.

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Enforcement

Position

6. Enforcement and inspection of all aspects of the fishery should be increased.

Rationale

Guides speak of bribes from lodge guests and itinerant fishermen from Norman Wells fishing with no regard to catch and possession limits. Also, the community and lodge owners refer to illegal guiding and outfitting being conducted from privately owned leisure cabins situated on the lake.

Research

Position

7. In order to better understand the impact of angling for trophy fish on the overall stock, better information is required on the fidelity of trophy lake trout to the areas where they hatch and/or are reared.

8. Research needs to be conducted on the size and age structure of unexploited portions of the lake in order to interpret fishing pressure data collected from trophy angling areas.

9. Better information is needed on distribution of spawning areas, rearing areas and life cycle biology and distribution of lake trout on Great Bear Lake.

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10. Better information is needed on the effects of landing and releasing lake trout. Are these sound conservation practises contributing to the stability of both breeding and trophy stocks or are they good for our conscience but not for the fish? Do we know that barbless hooks make a difference?

11. The relationship between fish migration in the Bear River and fish stocks in Great Bear Lake should be described in order to understand the possible effects of hydro-electric development proposed for the river.

Rationale

The community is aware that each lodge has a specified bed capacity. The community is also aware that the working hypothesis of DFO assumes a high degree of fidelity of lake trout to their territories. The community is aware of the tagging efforts of the past and has recovered tags from fish taken near the community but tagged in McTavish Arm. If the fidelity hypothesis is not valid, then the restriction should be on the number of fish taken rather than on the number of beds per lodge.

A size/age structure for unexploited portions of the lake in conjunction with data from a rigorous creel census can properly show the impact on lake trout stocks and point the way to area specific management strategies.

The role of releasing fish in the overall conservation effort must be research thoroughly. An experienced guide from Fort Franklin related how, after landing a 42 lb. trout with a minimum of handling, the guest decided to release it, "it did not swim again". Guidelines on the size of fish that can be released should be developed.

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Guide Training

Position

12. All guides should be provided with instruction on the role they play in fisheries conservation.

13. All guides should be trained in recording and transmitting basic monitoring data described in #4 above.

14. All guides should be instructed on the relevance of catch and possession limits to fish conservation and should be held accountable and so ensure that catch and possession limits achieve their intended conservation effect.

Rationale

The fishing guide is the key to effective fisheries conservation. Unless they are aware of and pursue the goals of this fisheries management plan, no creel census or research program can assist in achieving the ultimate conservation effort. The training and education required includes the use of barbless hooks, landing fish, handling fish, releasing fish, interpreting the law and recording and passing on daily data about their fishing activities.

This training should also include a thorough treatment of the relationship between guide and guest as it concerns fish conservation. This includes the subject of bribes etc. for exceeding catch and possession limits.

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Safety Aspects

Position

15. Each lodge should have its watercraft and related gear inspected by a qualified safety inspector prior to each season. Each boat should include modern comfortable personal floatation devices as well as clothing that guards against hypothermia.

16. Each guide should have basic water safety training and be required to demonstrate these skills prior to his/her being given responsibilities as a guide.

Rationale

The tragic drowning of a guide on the lake last summer is ample justification for increased water safety training and equipment. See Appendix 3 for the Coroners Jury's recommendations following the drowning death of a guide in the employ of Great Bear Lodge on 11 August 1984.

Future Management

Position

17. The distribution of fishing activity by both lodges, and any commercial fishing by persons from the community as well as catch and possession limits will be reviewed by the committee prior to authorization by the community and/or government. Likewise, changes to permit terms and conditions (ie. bed

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capacity) for lodge operations will be implemented only on the recommendation of the Committee.

Rationale

Cooperative management requires that all parties yield certain of their independent action in order to improve the long term effect of the management program. With good will and hard work this can be achieved with the Great Bear Lake fishery.

These objectives and procudures are proposed for the purpose of protecting the trophy sized lake trout stock in Great Bear Lake. It is the presence of this stock that may provide economic opportunities for the community. Economic opportunities which will both provide benefit for the people of Fort Franklin while maintaining a healthy stock of trophy sized fish. The community's participation in the future management of the lake and its role as a tourist attraction will depend in part on the degree to which these proposals are implemented.

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SUMMARY

The overall priority uses of fish in Great Bear Lake shall continue to be the domestic and subsistence use by the people of Fort Franklin and its outpost camps. A small commercial fishery potential is recognized for the future however the basic thrust of the management proposal goes to securing the long term viability of the trophy angling fishery.

The recommendations will secure an exclusive fishing area for the community, establish cooperative management, improve the data retrieval from the current fishery and improve fisheries management with new research. The overall fisheries conservation effort will be achieved with guide training. Guide and guest safety is addressed through inspection and training.

The proposals made can be achieved within the current administrative framework. Research and monitoring may require a realignment of existing budgets and manpower. None of the recommendations encroach on the aboriginal rights and claims of the Satudene.

Appendix 1. Summary of Trading Posts Operating on Great Bear Lake from 1870 to 1970

2D1 – Fort Franklin

2D1–1	Melvill, Cosmo Outpost. *Source:* 7–Whalley.	1908 – 1910	Ind.
2D1–2	Northern Traders Ltd. May not have been in continuous operation. *Source:* 2–PAC–36, 5686, 4–Baker, Porsild.	1920? – 1932	NT
2D1–3	Boland, A.W. Sold to HBC, 2D1–4. *Source:* 1–IAND, 2–PAC–5687, 4–Baker.	1926 – 1932	Ind.
2D1–4	Hudson's Bay Co. Outpost of Fort Norman until 1950. Purchased from Boland, 2D1–3. *Source:* 1–IAND, 7–Weir.	1932 – present	HBC
2D1–5	Hall, Middleton F. *Source:* 1–IAND, 4–Baker.	1932 – 1939	Ind.

2D2 – Cameron Bay

Former site of Port Radium, at 66° 04' N, 117° 53' W.

2D2–1	Ingraham, Victor *Source:* 2–PAC–7135, 4–Baker.	1931 – 1936	Ind.
2D2–2	Hudson's Bay Co. Post known as New Fort Dease. Moved to Port Radium. *Source:* 1–IAND, FETR, 7–*Beaver.*	1933 – 1937	HBC
2D2–3	Swanson, Henry *Source:* 1–FETR, 2–PAC–5668, 4–Baker. 7–Onraet.	1933 – 1937	Ind.

Source: Fur Trade Posts of the Northwest Territories 1870–1970 by Peter J. Usher. 1971. INAC. Northern Science Research Group.

2D3 – Port Radium

66° 05' N, 118° 02' W.

2D3–1	Hudson's Bay Co. Moved from Cameron Bay. *Source:* 1–IAND, FETR, 7–*Beaver.*	1937 – 1941	HBC
2D3–2	Giroux, M.M. *Source:* 1–FETR, T&T, 2–PAC–11168.	1939 – 1940	Ind.

2D4 – Hornby Bay

On north side, probably about 66° 40'N, 117° 40' W.
Exact location unknown.

2D4–1	Melvill, Cosmo *Source:* 7–Whalley.	1908 – 1909	Ind.

2D5 – Dease Bay

2D5–1	Melvill, C. and Hornby, J. On Dease Bay a few hundred yards east of the mouth of the Dease River, at 66° 53' N, 119° 01' W. Operated by Hornby alone after 1911. *Source:* 7–Whalley.	1910 – 1913	Ind.
2D5–2	Lamson & Hubbard Co. Probably at same location as HBC, 2D5–3. *Source:* 2–PAC–35, 2160, 4–Baker.	1920? – 1923	L&H
2D5–3	Hudson's Bay Co. On south shore, two miles southeast of Dease River mouth, at 66° 52' N, 118° 58' W. *Source:* 2–PAC–5687, 4–Porsild, 7–*Beaver.*	1923? – 1933	HBC
2D5–4	Boland, A.W. Unknown if location same as 2D5–3. *Source:* 4–Baker.	1923 – 1926	Ind.

2D6 – Good Hope Bay

Approximately at 66° 20' N, 124° 15' W. Exact location unknown.

2D6–1	Northern Traders Ltd. *Source:* 2–PAC–5686, 3–RCMP, 4–Baker, Brown.	1929 – 1929	NT
2D6–2	Overvold, R.V. *Source:* 1–IAND, 4–Brown.	1936 – 1945	Ind.

2D7 – Colville Lake

2D7–1	McNeely, W.J. Outpost. *Source:* 1–IAND, 4–Brown.	1961 – 1968	Ind.
2D7–2	Brown, Rev. B. Under cooperative management in 1970. *Source:* 1–NWT, 4–Brown.	1969 – present	Ind.

Appendix 2. Lodge Information

Name	Location	Year Build and/or Land Leased
GREAT BEAR LODGE		
basecamp		
Bear Island	65°35 120°01	1964-1965
Sawmill Bay	65°42 118°55	1964-1965
outcamps		
Neiland Bay	65°45 119°46	1967
GREAT BEAR LAKE LODGE		
basecamp		
Conjuror Bay		1961-1963
Dease Arm	66°37 119°45	1968
BRANDON'S LODGE		
basecamp		
Cameron Bay		1962-1963
outcamps		
Katseyedie River		1973
ARCTIC CIRCLE LODGE		
basecamp		
Maclavish Arm	66°20 117°46	1964
outcamps		
Takaatcho River	66°30 118°08	1968
Appleby Point (Hornby Bay)		1968
TROPHY LODGE		
basecamp		
Ford Bay	66°02 124°40	1969
outcamp		
Good Hope Bay	66°20 124°20	1969
SAW-TEW LODGE		
basecamp		
Fort Franklin	65°11 123°26	1970

Source: Department of Fisheries and Oceans, Yellowknife.

nquisition

Coroners Ordinance

CANADA

NORTHWEST TERRITORIES

TO WIT:

An Inquisition taken for the Commissioner of the Northwest Territories at ~~the house of~~ Ft. Franklin in the ~~North West~~ ~~of~~ Territories on the 6th day of February 19 85 (~~and by adjournment on the~~ ~~day of~~ 19 ~~!~~ before Sheldon HEBB ~~a coroner for the~~ ~~a coroner for the~~ Northwest Territories, ~~on view of the body of~~ then ~~then and there lying dead~~, the undersigned and

(Name of Jurymen, if applicable)

being duly sworn and charged to inquire for the Commissioner when, where how and by what means the said Phillip MODESTE came to his (~~her~~) death, do upon their oath say:

In witness whereof, the coroner has hereunto set his hand (and, the jurymen have hereunto set their hands), this 6th day of February 19 85

FTATTI

o the deceased was:

2-86

PHILIP MOOSETE

n the deceased died

BETWEEN THE HOURS OF 0540 AND 0610 ON THE MORNING OF AUGUST 11, 1984

ere the deceased died

IN GREAT BEAR LAKE APPROXIMATELY 200 YDS OFFSHORE IN THE VICINITY OF LIGHT HOUSE POINT

w the deceased died

DROWNING

What means the deceased came to his death

THE CAPSIZING OF ITS BOAT WHILE ATTEMPTING A RETURN TO THE GREAT BEAR LAKE LODGE CAMP AT NEILAND BAY THIS ATTEMPT BEING MADE THROUGH EXTREMELY HAZARDOUS WATER AND WEATHER CONDITIONS

commendations:

ATTACHED RECOMMENDATIONS NUMBERED 1 TO 5 BOARD VOTED BY.

FTATTI

Vincent O'Neill

1. THAT A TRAINING PROGRAM BE IMPLEMENTED AS SOON AS POSSIBLE INCLUDING A REFRESHER COURSE FOR GUIDES NOW WORKING. THIS PROGRAM TO LEAD UP TO A CERTIFICATION STANDARD AND ALL GUIDES MUST POSSESS SUCH CERTIFICATION IN ORDER TO WORK COMMERCIALLY. TRAINING SHOULD INCLUDE WATER SAFETY, EMERGENCIES, FIRST AID, BASIC WORKINGS OF ANY EQUIPMENT TO BE HANDLED, PUBLIC RELATIONS AND KNOWLEDGE OF REGULATIONS GOVERNING THE INDUSTRY INVOLVED.

2. THAT THE R.C.M.P, OR A SUITABLE AGENCY, INSPECT EACH TOURIST ESTABLISHMENT OR OUTFITTER ANNUALLY, BEFORE START-UP OF ITS OPERATIONS, TO ENSURE THAT ALL EQUIPMENT, FACILITIES AND SUPPLIES MEET APPROVED STANDARD

3. A SUITABLE, D.O.T. APPROVED LIFE JACKET BE WORN BY ALL OCCUPANTS OF ANY COMMERCIALLY OPERATED BOAT USED IN CONJUCTION WITH A TOURIST ESTABLISHMENT OR AN OUTFITTER

4. THAT EACH OPERATOR OF A TOURIST ESTABLISHMENT OR AN OUTFITTER, HAVE AND MAINTAIN A PROGRAM TO FAMILIARIZE EMPLOYEES WITH THEIR OPERATIO THIS PROGRAM TO COVER ITEMS SUCH AS RESPONSIBILI CHAIN OF COMMAND AND KNOWLEDGE OF THE LOCAL AREA.

5. MINIMUM AGE OF GUIDES BE 21 AND ALL GUIDE SHOULD BE LICENSED.

Appendix 4

Lodge Industry Response
to Interim Report

POSITION PAPER

GREAT BEAR LAKE LODGES
On the "Interim Report Management Plan for the Great Bear Lake Fishery"

November, 1984

INTRODUCTION

AGENCY GOALS

FISHERY MANAGEMENT PRINCIPLES

FISHERY MANAGEMENT ISSUES
- Domestic Fishing
- Lodge Access Sports Fishery
- Itinerant Sports Fishery
- Commercial Fishery
- Management of Resource Use Conflict
- Management Plan and Land Claims Negotiations

INTRODUCTION

The "Position Paper" on the "Interim Report Management Plan for the Great Bear Lake Fishery" is documented on behalf of the Great Bear Lake lodge owners and the Travel Industry Association of the N.W.T. Although there are many issues concerning the future of Great Bear Lake in relation to the sports fishing lodges, we have attempted to keep our comments within the context of the "Interim Management Plan".

The lodge owners of Great Bear Lake lodges appreciate this forum as a means of replying to the draft "Management Plan for the Great Bear Lake Fishery". The comments in this "Position Paper" are those of the lodge owners and generally those of the TIA of the NWT.

We do not agree with, or understand, the reason why the discussion surrounding the draft Great Bear Lake Management Plan and the involvement or concern of the Fort Franklin people has become so blown out of proportion. From our research and contacts with the Franklin people and their consultant, we find they never were serious about commercially fishing the lake, nor did they seem to have much interest in increased guiding at the lodges.

AGENCY GOALS

As four of the five operational lodges on Great Bear Lake are owned by Canadians, we cannot argue with the goal of the Department of Fisheries and Oceans; that "the fish resource of Great Bear Lake make their largest contribution to the economic and social welfare of Canada subject to the requirement of resources being conserved."

We strongly feel that as Canadians, we have developed and are continuing to develop our lodges as an economic and social contribution to the NWT, but, more importantly, to Canada.

We are concerned that any or all programs or departments relating to the fishery are efficient and the the fishery itself is efficient and profitable, both economically and socially.

We do not disagree with domestic fishing rights but question the Department of Economic Development and Tourism's priority in supporting a domestic fishery over one of sports fishing - especially when their mandate is one of Economic Development!

FISHERY MANAGEMENT PRINCIPLES

Little can be said about established fishery management principles as outlined in the initial section of interim reports.

FISHERY MANAGEMENT ISSUES

Domestic Fishery

The current informal agreement between Fisheries and Oceans and the people of Fort Franklin regarding use of resources for domestic use is, in our view, satisfactory. We would stress, however, observation of the areas used by the lodges so as to keep overlap use to a minimum.

We do not expect an increase in Franklin's domestic needs and assume that no other NWT community would fish Great Bear Lake for domestic purposes - due strictly to location.

Subsidized fishing, whether domestic or commercial, is not the approach to take.

Monitoring of the domestic harvest could only assist in the long term management of Great Bear Lake. This, we assume, would be accomplished with minimal effort.

Lodge Access Sports Fishery

In choosing between a choice of:

1) whether to manage for a maximum yield of larger fish, or
2) maximum sustainable fish (more, smaller fish)

we feel that management for yield of larger, i.e. trophy fish, is essential.

We are concerned that the reference to choice of management strategy for fishing quality may adversely change the number of anglers, fishing effort, and total lodge harvests.

Our #1 concern is the present and future condition of the fishery resource on Great Bear Lake. This has been, and will continue to be, foremost in our minds. To overfish any part of the lake would, in the medium and long term, be a detriment to our own business. We need a continued healthy resource; it is essential to our staying in business! We not only require a healthy resource, we more specifically require a healthy resource of large trophy fish. For many years now, our lodges have co-operated fully with the Federal Dept. of Fisheries on any program which will tell us more about our resource and any program that allows for large catch and possession limits. One lodge has a policy in effect now of no fish taken except for shore lunches and lodge meals. Great Bear Lodge, for example, in 1984 took a season total of 300 fish, 70 of which were trophies. Approximately 2,000 lake trout were, however, caught and released every week during the eight-week season.

From recent Federal Fisheries findings, the stock of Great Bear fish are in good shape, primarily due to decreasing pressure by our lodges. If any change of direction were suggested, we would support decreased fishing pressure on Great Bear Lake to ensure stocks of trophy trout indefinitely.

No additional lodges or camps should be allowed on Great Bear Lake (excepting Sah-Tu's potential). As stipulated in the Interim Report and by the Commissioner in the 1960's, there is no area for future expansion for either outpost camps or lodges. Although the lake is large, the lodges are presently spread around the lake so as to fully utilize the resource potential. An increased number of fishermen on the lake could have an effect on the resource as well as the marketability of the product.

For years there has been a verbal agreement as to areas each lodge will fish. The area of general interest to the people of Fort Franklin has also been understood. However, to alleviate any chance of fishing area disputes, it is a suggestion to clearly define those areas.

We agree that any future sports fishery development on Great Bear Lake should be kept within the confines of the existing licenced lodges, including Sah-Tu. However, there are a number of options for interested parties to become involved in the sports fishery on Great Bear Lake:

1. purchase outright of any existing facility;
2. purchase part of an existing facility; or
3. joint ventures.

The needs of the North American sports fishing market do change slightly from year to year. The lodge owners and Federal Fisheries should maintain close contact to ensure fish resources and marketing techniques coincide. We must give the market what it wants.

We encourage local Dene groups, especially from Fort Franklin, Fort Good Hope, Colville Lake, etc., to become increasingly involved in the sports fishery in terms of employment (guides, cooks. cleaners, assistant managers, etc.), and also in terms of ownership.

There is excellent grayling fishing at the mouth of the Bear River as well as trophy lake trout fishing in the Keith Arm. The lodge owners are certainly open to proposals from the people of Ft. Franklin regarding joint development of Sah-Tu Lodge or joint ventures between Franklin and the existing lodges.

There is an acute lack of understanding of the lodge business, primarily by Dene people, but also by government officials. Many non-lodge people understand the lodge business to open July 1 and close at the end of August; few comprehend the marketing, booking, ordering, expediting and so on that takes place the balance of the year.

With respect to employment, some lodges do employ a large number of Dene staff, while others do not. Success with native guides, cooks and various other staff has not, in some areas, been good, and for a variety of reasons. We are, however, willing to take on a larger percentage of native staff if Government provides some concrete assistance in terms of specific program funds for us to do our own guide training programs. All lodge owners do have some form of guide training/lodge introduction but additional "awareness", "hosts", "introduction to tourism", "first aid", and other programs would do a great deal to assist lodges in hiring locally.

We should emphasize that the reason for the success of our lodges is due not only to excellent Trophy Wilderness Sportsfishing but also to the service and hospitality of all staff shown to the sportsfishermen - our guests. Return customers and word of mouth advertising from past customers is critical. We strive to keep all customers as satisfied as possible. We cannot afford to have problems with inhospitable, careless and unreliable staff.

Some of Great Bear lodges hire mostly Dene staff primarily from Fort Franklin and Fort Good Hope, others have a few or no Dene whatsoever. All lodges have, however, over the years, given local Dene first chance at jobs and hired Dene with varying and sometimes limited success. Whoever is hired, our "quality" reputation is foremost in our mind.

We agree that there is a need to manage the resource for both:

1) Resource revenues; and
2) Employment and regional incomes.

Although as private lodges we operate, as any business does, for a profit, we do recognize the need for increased local employment and benefits. These benefits should, however, be earned, i.e. meaningful employment, not subsidization.

We are totally against measures such as increased fishing licence fees, trophy fish royalties, and negotiated fishing leases, as suggested if management was for strictly "resource revenues".

On the other hand, managing strictly for "employment and regional incomes" is of little relevance to a sports fishing lodge being operated as a small business seeking a profit.

The average marketing expenditure per year for each of the Great Bear lodges is now in the area of $55,000. For five lodges a 1984 net figure of $275,000 is more than 1/2 of the total TravelArctic budget to be spent on the whole of the N.W.T. for the same period. As the lodges have been operating for fifteen years, the amount of promotional/marketing efforts, goodwill, word of mouth and repeat customers to the NWT as a direct result of Great Bear lodges has been considerable. No other single (or combined) component of the travel industry in the NWT has brought such extensive business to the north over the years.

The majority of all expenses, except for airlines, marketing and some key staff wages, are spent in the NWT.

Contrary to popular belief, the lodge businesses, even the long established lodges in Great Bear, are not large "profit makers". In the 1960's, profits could be made with the lodges at 60-70% capacity, but in the 1980's with escalating expenses, profits are usually only made if occupancy rates are 90%+ - an extremely difficult challenge in today's competitive industry.

Regulatory mechanisms are required for the long term life of the fishery; however, we do not wish to become entangled in an ever-increasing number of regulations and regulatory bodies.

Since 1973, excess fillets from one lodge have been offered to the community of Fort Franklin with no success. Attempts such as this have been made to assist the people of Fort Franklin, but little progess has been made.

One example of overfishing on Great Bear Lake is in Sawmill Bay, which was heavily fished 12 - 15 years ago. Very little fishing has been done on Sawmill Bay in twelve years, and the resource has yet to return to its original state.

As the future of the fishery resource is our #1 priority, we feel increased research, not just "creel census", should be initiated.

Itinerant Sports Fishery

There is presently very little itinerant sports fishing on Great Bear Lake, and we see no foreseeable increase in the next 10 - 20 years due to high transportation costs from communities with float planes. We would, however, expect the Departments of Economic Development & Tourism, Fisheries, and Renewable Resources, to continue policing Great Bear Lake to ensure that no outfitting (i.e. paid fishermen flying in a Twin Otter from Norman Wells) is allowed.

We feel at this time that any Canadian residents should have the opportunity of open access to sports fishing throughout the NWT, including Great Bear Lake; in actual fact, however, we expect very few to take advantage of this in Great Bear Lake.

Commercial Fishing

From discussions with the Fort Franklin people and some Federal Fisheries contacts, we found that the development of a commercial fishery is not a priority project for that community, contrary to what is stated in the draft Management Plan.

The Fort Franklin people realize a commercial fishery is not economically viable and that it could, in the long run, seriously effect the fish stocks of Great Bear Lake. It seems that people outside of Fort Franklin have been more interested in a commercial fishery than the people in Fort Franklin!

It seems ludicrous to pursue the option of commercial fishing when:

1) the local people are not 100% in favour of it;
2) there is no "economic vent"
3) it is not a viable operation;
4) it adversely effects the already established economically viable sports fishing lodges; and
5) there is limited information on the resource in the area of potential development.

It is a well-known fact that commercial fishing can, and will, ruin a sports fishing lake - the two are just not compatible. Numerous examples can be cited in northern Manitoba, and central and northern Saskatchewan as well as Ontario.

Allocating suitable resources to competing uses is much simpler when the uses are limited. We would much prefer that the Fort Franklin people pursue the sports fishery either via Sah-Tu lodge, or in conjunction with one or more of the existing lodges than to pursue the commercial fishing option. In that way, economic returns can be realized while at the same time not adversely effecting the fish resource.

Great Bear Lake should be managed only for:

1) a domestic fishery for the Fort Franklin people; and
2) a sports fishery for the existing lodges, including Sah-Tu (Fort Franklin)

The Interim Management Report talks of assessing the benefits provided by a commercial fishery and goes on to indicate total benefits from Great Bear may be increased with a commercial fishery. Their statement certainly contradicts other sections of the study that say commercial fishing is not economically viable. Why risk a valuable sports fishing industry for a non-viable commercial fishery?

Management of Resource Use Conflict

The Great Bear Lake lodge owners , being the primary source of economic contribution from Great Bear Lake resources, feel that we must have a say in both management and any resource use conflict. The "Interim Report Management Plan for the Great Bear Lake Fishery" was put together by four governmental agencies, while the actual resources user, i.e. lodge owners, people of Fort Franklin, were omitted from being directly involved in this process. We, as lodge owners, must have representation on any working group or advisory boards discussing the future of Great Bear Lake.

For purposes of management planning and resource use conflict, we suggest an advisory board consisting of one representative each from Fort Franklin, lodge owners, Department of Fisheries & Oceans, Department of Economic Development & Tourism, Department of Indian & Northern Affairs, and the Department of Renewable Resources. This six person board would be responsible for all Great Bear Lake issues, the prime issue being the future of Great Bear Lake fish stocks.

Management Plan and Land Claims Negotiations

We agree that the fish resources of Great Bear Lake should make their greatest contribution economically and socially to Canadians - as present owners of the resource.

If, under the land claims process, someone other than "all Canadians" should own the resource, we ask that two points remain clear:

1) that the fishery resource and the future of it remains all-important;
2) that the existing lodge owners (as title holders or long-term lease holders) have long term established equity in their facilities, goodwill, and preservation of fish stocks of Great Bear Lake.

It should be noted that some lodge owners have long-term leases while others have title or own outright their property on Great Bear Lake.

Appendix 5

Overview of Results of Consultation with Resource Users

APPENDIX 5

RESULTS OF CONSULTATION WITH RESOURCE USERS

Both the lodge industry and the community share the view that Great Bear Lake should be managed with the following objectives in mind;

1. to provide for the domestic fishing needs of the community of Fort Franklin;
2. to maintain the lodge-access sport fishery as a high quality trophy angling fishery;
3. to manage Great Bear Lake for domestic and sport fishing uses is preferable to any commercial gill net fishery for export. While the lodges are "totally against any commercial fishing ventures", the community has requested that provision be made for small selective commercial fisheries at outpost camps to meet any local and regional markets which may develop.

Insofar as items 1 and 2 are consistent with what are generally considered to be best-use alternatives, the basic ingredients for a "best-use" solution are available. However, because of differing views on how these goals are best achieved there will have to be a careful assessment of alternative management strategies. The following review first summarizes the issues raised by the working group and the responses of the community of Fort Franklin and the lodge industry.

DOMESTIC FISHERY

INTERIM REPORT

The working group identified the requirement to estimate the future needs of the domestic fishery, to provide sufficient fish resources to meet those needs and to develop a monitoring system to indicate how the needs are being met.

A decision will be required as to whether informal arrangements should continue or whether there should be an explicit allocation of fish resources by specifying the species, areas and quantities for domestic use i.e. a domestic quota.

There is a requirement for close coordination of the management plan with financial assistance programs which facilitate access to the domestic fishery.

LODGE INDUSTRY

The current informal arrangements are satisfactory.

Observation of areas used by lodges so as to keep overlap use to a minimum.

There will not likely be an increase in the requirements for a domestic fishery.

Monitoring could only assist long-term management.

Subsidized fishing is not the route to follow.

FORT FRANKLIN

The management plan should provide for the subsistence and domestic fish requirements for the community of Fort Franklin and the camps occupied by the Satudene.

Proposal that Keith Arm and McVicar Arm be reserved for fishing activities of Fort Franklin residents and that no lodge based fishing take place within 10 miles of existing Satudene camps and cabins.

LODGE-ACCESS SPORT FISHERY

INTERIM REPORT

There is a requirement to select which quality attributes the fishery should be managed for and to tailor the regulation of angling effort and

harvest accordingly. The department has to decide whether its fishery management goals are best met by a choice to maintain effort and harvest at current levels and current quality, or whether it would be better to vary effort, harvest and quality.

There will have to be a choice between two rival management strategies. It will be necessary to decide whether it will be better to adopt a management strategy (a) of maximizing the yield of larger fish, or (b) of maximizing the sustainable yield, resulting in harvests of more, smaller fish.

The second management issue, which really follows from the first, is to decide how many anglers, how much fishing effort and what harvests will be allowed on Great Bear Lake.

Within the Keith Arm, there will have to be consideration of the most likely future operations of the Sah Tew lodge, Fort Franklin and the extent to which sportfishing activity in the Keith Arm will increase as a consequence of the recently completed hotel complex.

The management issue is whether the department should maximize the economic yield rather than the economic impacts provided by the lodge industry. If the fishery is to be managed for economic impact, the department will have to compromise its stated goals for the fishery. In this situation, for economic impacts in the NWT to be maximized, it is also quite likely that GNWT would have to consider regulating the purchasing and hiring patterns of the lodge industry.

In the event that the department adopts a management strategy of maximizing the economic yield from the fishery, it will be necessary to consider how best to regulate the fishery.

LODGE INDUSTRY

Management for the yield of trophy fish is essential.

If any change were suggested, would support decreased overall fishing pressure on Great Bear Lake to ensure stocks of trophy trout indefinitely.

No additional lodges or outcamps should be allowed, excepting the Sah Tew lodge potential.

Suggestion to clearly define areas.

Opportunity exists to participate in the industry through purchase or joint venture.

Lodges are willing to take on larger percentage of Dene staff if government provides funds for lodges to do their own guide training programs.

Recognize the need for increased local employment and benefits.

Totally opposed to measures such as increased fishing licence fees, trophy fish royalties and negotiated fishing leases.

Feel that increased research, not just "creel census" should be initiated.

FORT FRANKLIN

The community offered 17 recommendations for the future management of the sport fishery on the lake, covering a wide range of topics from management to research, enforcement and guide training:

Angling activity be restricted to McTavish Arm, Smith Arm and Dease Arm and no lodge based fishing take place within 10 miles of existing Satudene camps and cabins.

Angling distribution pattern be returned to that of 1970.

The management plan should be monitored by a committee consisting of the Satudene, DFO and GNWT.

Each lodge should report vital statistics on all fish langings, releases, shore lunches, and fish removed to the lodge.

Each lodge shall provide a certified copy of its guest book indicating, by providing their angling licence number, which guests were anglers and which were not.

Enforcement and inspection of all aspects of the fishery should be increased.

Better information is required on the fidelity of lake trout to the areas where they hatch and/or are reared.

Research needs to be conducted on the size and age structure of unexploited portions of the lake in order to interpret fishing pressure data collected from trophy angling areas.

Better information is needed on distribution of spawning areas, rearing areas and life cycle biology and distribution of lake trout on Great Bear lake.

Better information is needed on the effects of landing and releasing lake trout.

The relationship between fish migration in the Bear River and fish stocks in Great Bear Lake should be described in order to understand the possible effects of hydro-electric development proposed for the river.

All guides should be provided with instruction on the role they play in fisheries conservation.

All guides should be trained in recording and transmitting basic monitoring data described in #4 above.

All guides should be instructed on the relevance of catch and possession limits to fish conservation and should be held accountable and so ensure that catch and possession limits achieve their intended conservation effect.

Each lodge should have its watercraft and related gear inspected by a qualified safety inspector prior to each season. Each boat should include modern comfortable personal flotation devices as well as clothing that guards against hypothermia.

Each guide should have basic water safety training and be required to demonstrate these skills prior to his/her being given responsibilities as a guide.

The distribution of fishing activity by both lodges, and any commercial fishing by persons from the community as well as catch and possession limits will be reviewed by the community and/or government. Likewise, changes to permit terms and conditions (i.e. bed capacity) for lodge operations will be implemented only on recommendation of the committee.

ITINERANT SPORT FISHERY

INTERIM REPORT

The working group described the need to have some form of direct control on total fishing effort in order to maintain sport fishing quality. For this principle to be applied, it would be necessary to include itinerant fishing effort in the total allowable fishing effort and to regulate the fishery accordingly.

LODGE INDUSTRY

Not likely to be an increase in itinerant sports fishery in next 10-20 years.

Request that government ensure that no illegal outfitting be allowed.

Canadian residents should have the right of open-access to sports fishing throughout the NWT, including Great Bear Lake.

FORT FRANKLIN

Community requested that there be better enforcement of all aspects of the fishery, making reference to itinerant fishermen from Norman Wells fishing without regard to catch and possession limits.

COMMERCIAL FISHERY

The working group identified the need to initiate biological investigations to assess the resource base in the Keith Arm, John Hoe and Whitefish rivers in order to identify the annual sustainable yields from each area.

One management issue is the need to identify the potential impacts of commercial fishing on recreational fishing.

The issue for agencies concerned with economic and social development is whether or not they are willing to provide public funds in support of a development with extremely unfavourable financial prospects.

LODGE INDUSTRY

Development of a commercial fishery is not a priority project for the community.

Great Bear Lake should not be managed for a commercial fishery.

FORT FRANKLIN

Aware of the impact a commercial net fishery could have on fish stocks.

Aware that under current economic conditions an export market for whitefish may not be economically viable.

Requested provision for small selective commercial fisheries at outpost camps on Great Bear Lake to meet any local and regional markets which may develop.

Area of Keith and McVicar Arms proposed to be reserved for fishing activities of Fort Franklin residents.

MANAGEMENT OF RESOURCE USE CONFLICT

INTERIM REPORT

There has to be a decision made to either rely on the existing system of solving resource use conflict or to move to a market based solution.

There will have to be related choices on what consultative mechanisms are best suited for the ongoing management of the fishery.

LODGE INDUSTRY

Propose an advisory board consisting of 6 members, one from each of the lodge industry, the community, DFO, Economic Development and Tourism, Renewable Resources and DINA.

FORT FRANKLIN

Proposal for a management committee (as noted above) which would consist of the Satudene, DFO and GNWT.

POOR
QUALITY
ORIGINAL